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LUCERNE MANURIAL TESTS.

STATE RESEARCH FARM, WERRIBEE.

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Lucerne is one of the staple crops of the irrigation areas, and its cultivation is rapidly extending. In 1914-15, there were 71,217 acres of lucerne in the irrigation settlements of the State, as compared with 55,535 acres in 1913-14. Its cultivation is spreading through Gippsland, where the ample rainfall enables heavy crops to be grown without irrigation.

Water Requirements of Lucerne.

Where soil and climatic conditions are favorable to its growth, lucerne is one of the most profitable of forage crops. It requires, however, considerable quantities of water to produce heavy cuts of hay, and, given a well-drained soil and a warm climate, the yield of hay is, within certain limits, approximately proportional to the rainfall, or to the amount of irrigation water applied. In carefully controlled tests at Rutherglen and Werribee, to determine the Water Requirements of the crop, it has been found that at least 7 inches of rain or irrigation water were required to produce a ton of lucerne hay per acre. Allowing for the inevitable loss of water from the soil by evaporation, it would hardly be possible to grow a ton of lucerne hay under Victorian conditions on much less than 9-10 inches of rain or irrigation water. To secure annually a yield of 5 tons per acre, lucerne must have an amount of water equivalent to 45 inches of rain. If the rainfall, say, is 20 inches per annum, then, to secure a yield of 5 tons per annum, the rainfall must be supplemented by another 25 inches of irrigation water. It will be seen, therefore, that, apart from the quality of the soil, heavy yields of lucerne are only to be expected—

(1) In districts of abundant rainfall, or
(2) Where subterranean water is within easy reach of the lucerne roots.
(3) Where irrigation is practised.

Soil Requirements of Lucerne.

So far as the soil conditions are concerned rich river flats resting on a well-drained, porous subsoil present almost ideal conditions for lucerne.

The soils of the Nemingha Valley, in New South Wales, and at Bacchus Marsh, Victoria, and the reclaimed swamps along the Murray River (S.A.) are of this character, and it is on these soils that we see lucerne at its best.

In these subsoils the lucerne can develop its wonderful root system, carry on its unequalled power of nitrogen fixation, and draw the necessary water supplies for the vigorous overhead development of the plant.

In the Nemingha Valley irrigation is unnecessary, as the district enjoys a good rainfall and the roots are within easy reach of subterranean water. On the reclaimed swamps of the Murray River and at Bacchus March lucerne may be seen at its best under irrigation.

Fig. 1.—View Showing Method of Harvesting Lucerne, State Research Farm, Werribee.

The high rentals paid for lucerne lands in these areas are a striking testimony of the wealth-producing power of the lucerne plant. Unfortunately the areas of such superlatively rich soil are limited, and the great bulk of the soil and subsoil on which lucerne is grown has neither the favorable mechanical condition nor the chemical composition of these naturally rich soils. Much of the lucerne in the irrigation areas has been sown on old wheat lands. These consist mostly of clay loams resting on a more or less stiff clay subsoil. These soils are well suited for wheat-growing, but the subsoils are generally too stiff to permit the perfect development of the root system of the lucerne, and the overhead growth—and consequently the yield of produce per acre—is considerably less than that of the more favoured districts. On many of the settlements, particularly Cohuna, and Bamawm, and Shepparton, loamy soils resting on porus subsoils are often met with, and on these

the growth of lucerne leaves little to be desired, and the yields from such soils under irrigation compare favorably with the best lucerne lands in Australia.

The Werribee Soils.

The soil at present under lucerne at the State Research Farm, Werribee, is similar in character to much of the land in the Goulburn Valley. It consists of reddish clay loam 7 inches to 10 inches deep, resting on a stiff, red clay subsoil. It takes water slowly and sets hard after irrigation. It is naturally deficient in organic matter, and continuous cropping with cereals for twenty-six years prior to the laying down of the lucerne tests had considerably depleted the already limited reserves of this all-important soil ingredient. The land, therefore, was in a similar condition to much of the soil in the northern irrigation areas, where wheat-growing had been carried on for at least a geueration prior to sowing down with lucerne.

The results obtained at Werribee justify the view that even on these worn-out lands heavy and profitable crops of lucerne can be grown. In October, 1912, a block of 15 acres was subsoiled 12 inches deep, graded, and sown with Tamworth lucerne. In the following season six cuts were obtained from this area, and the block averaged 6½ tons of commercial hay (85 per cent. of dry matter) over the weighbridge.

Preliminary experiments with various manures suggested a promising field for investigation, and in September, 1913, a series of manurial tests were laid down to test the value of different manures on the yield of lucerne. Unfortunately, however, since 1913, there has been a chronic shortage of irrigation water owing to the breakdown of the water supply at Pyke's Creek Reservoir, and the value of the results of the tests has been considerably impaired.

The Plots.

The tests comprise trials of nitrogenous, potassic, and phosphatic manures, stable manure, lime, and ground limestone.

The plots were each 10 chains long and .15 acre in area, and sown on land with a natural fall of 2½ inches to the chain, with the plots running along the contour lines and at right angles to the flow of the water. The plots were sown with Tamworth lucerne at the rate of 16 lbs. per acre in September, 1913.

During both 1914 and 1915 the Pyke's Creek Reservoir, upon which the Werribee Irrigation Settlement has hitherto depended, failed. Each irrigation season the lucerne received only three waterings during the growing season and this, combined with the deficient rainfall, prevented the lucerne making full development.

Had a full supply of irrigation water been available, it is certain that the yields would have been much higher than they were. As it was, only five cuts were obtained in the 1914-15 season, and but four cuts in 1915-16, instead of the customary six and seven cuts in a normal irrigation season. Each plot was cut separately with a mower and raked into windrows, cocked, and weighed over the weighbridge.

A sample of hay was taken from every load and the amount of dry matter determined so as to reduce the weights to a uniform basis for comparison. In all cases the returns have been calculated in terms of commercial hay (85 per cent. of dry matter).

The results are summarized in Table I.

TABLE I.—SHOWING WEIGHT OF LUCERNE HAY CUT FROM PLOTS TREATED WITH VARIOUS MANURES.

No. of Plot.	Treatment.	1914–15.	1915–16.	Total Cut for Two Seasons.
		tons cwt.	tons cwt.	tons cwt.
4	Lime 20 cwt. + Super 1 cwt. + Nitrate of Soda 1 cwt.	5 19·1	4 13·6	**10 12·7**
3	Lime 20 cwt + Stable Manure 10 tons ..	5 9·0	5 3·6	**10 12·6**
1	Lime 20 cwt. + Super 2 cwt. + Blood Manure 1 cwt.	5 13·1	4 18·8	**10 12·4**
5	Lime 20 cwt. + Super 2 cwt. + Sulph. of Potash 1 cwt.	5 2·8	5 5·6	**10 8·4**
2	Lime 40 cwt. + Super 2 cwt.	5 4·2	5 16·8	**10 1·0**
9	Lime 20 cwt. + Super 2 cwt.	5 8·3	4 4·8	**9 13·1**
12	Super 2 cwt. only	5 11·0	4 1·6	**9 12·6**
8	Lime 20 cwt. + Thomas' Phosphate 2 cwt. ..	5 4·2	4 5·6	**9 9·8**
7	Lime 20 cwt. + Bonedust 2 cwt.	5 7·8	4 1·6	**9 9·4**
6	Lime only 20 cwt.	5 3·0	3 6·8	**8 10·6**
10	Ground Limestone 36 cwt.	4 16·8	3 13·6	**8 10·4**
11	No manure (check plot)	4 12·7	3 4·8	**7 17·5**

TABLE II.—SHOWING PROFIT PER ACRE FROM VARIOUS MANURES APPLIED TO LUCERNE.

No. of Plot.	Treatment of Plot.	Total Weight of Hay for Two Seasons.	Increase over Unmanured Plot.	Value of Increase per acre at £2 10s. per ton.	Cost of Manure per acre.	Net profit per acre over Unmanured Plot.
		tons cwt.	tons cwt.	£ s. d.	£ s. d.	£ s. d.
4	Lime 20 cwt., Super 2 cwt., Nitrate of Soda 1 cwt. ..	10 12·7	2 15·2	6 18 0	2 15 0	**4 3 0**
1	Lime 20 cwt., Super 2 cwt., Blood Manure 1 cwt. ..	10 12·4	2 14·9	6 17 3	2 9 3	**4 8 3**
3	Lime 20 cwt., Stable Manure 10 tons	10 12·6	2 15·1	6 17 9	2 15 0	**4 2 9**
5	Lime 20 cwt., Super 2 cwt., Sulph. of Potash 1 cwt. ..	10 8·4	2 10·9	6 7 3	2 15 0	**3 12 3**
9	Super only 2 cwt.	9 12·6	1 15·1	4 7 9	0 10 0	**3 17 9**
8	Lime 20 cwt., Super 2 cwt. ..	9 13·1	1 15·6	4 9 0	2 0 0	**2 9 0**
10	Lime 20 cwt., Basic Slag 2 cwt.	9 9·3	1 12·3	4 0 11	2 0 0	**2 0 11**
7	Lime 20 cwt., Bonedust 2 cwt.	9 9·4	1 11·9	3 19 9	2 2 0	**1 17 9**
2	Lime 40 cwt., Super 2 cwt. ..	10 1·0	2 3·5	5 8 9	3 10 0	**1 18 9**
6	Lime only 20 cwt. per acre	8 10·6	0 13·1	1 12 9	1 10 0	**0 2 9**
10	Ground Limestone 36 cwt. per acre	8 10·4	0 12·9	1 12 3	1 11 6	**0 0 9**
11	Nil (Control Plot)	7 17·5	Nil	Nil	Nil	Nil

In computing the above results, the approximate cost of the fertilisers on the farm was taken as a basis of comparison. The values per ton for the artificial fertilisers were—Ground lime, 30s.; ground limestone, 17s. 6d.; superphosphate, £5; basic slag, £5; bonedust, £6; blood manure, £9; nitrate of soda, £15; sulphate of potash, £15.

A perusal of these returns will give some interesting comparisons. Taking the results for the two years the following deductions would seem to be permissible:—

1. *The Use of Lime and Ground Limestone.*—The application of lime or ground limestone has increased the yields of hay by 12½ cwt. per acre. There is practically no difference in yield between the results from a ton of lime per acre and its equivalent in the form of ground limestone (36 cwt.). It will be seen that the first season the quick lime gave a better return than the ground limestone, but in the second year the returns were reversed. So far as the profit is concerned, it will be seen that, with lucerne hay averaging 50s. per ton over a period of years, the increased return for the two years is just sufficient to cover the cost of the manure and its application. In fairness to the lime and ground limestone it should be added that the effects of these applications are likely to persist for more than two years, and the whole cost of the manure therefore should not be debited to the

Fig. 2.—View of Fifty-acre Block of Lucerne, Fertilised with 2 cwt. Superphosphate per acre, State Research Farm, Werribee.

first two seasons' returns. Moreover, had more irrigation water been available, it is probable that the differences in yield compared with the unmanured plot would have been still more striking.

2. *The Value of Phosphatic Manures for Lucerne.*—The results unmistakably demonstrate the value of phosphatic manures for lucerne, and particularly superphosphate. A comparison of the yields from Plots 7, 8, and 9 (lime with 2 cwt. phosphate) with that from Plot 6 (lime only) shows that the addition of 2 cwt. of a water soluble (super), a citrate soluble (basic slag), or an insoluble phosphate (bone dust) increases the yield of hay by a ton per acre.

As 2 cwt. of the phosphate costs but 10s. to 12s. the profit on the outlay is at least £2 per acre. It will be noted, however, that when superphosphate and 20 cwt. lime are applied in combination the yields are practically the same as super applied by itself. Thus Plot 12, treated with super 2 cwt. gave 9 tons 12.6 cwt., whilst the addition

of a ton of lime (Plot 9) increased the yeld of hay by only a half hundredweight.

Even the addition of an extra ton of lime (Plot 2) gave only 8 cwt. extra of hay over Plot 9, an increase which would not cover the cost of the additional manure. Moreover, of all the phosphatic manures it will be noted that super is the most effective.

3. *Nitrogenous Manures.*—One of the most striking features of the table is the effect of the nitrogenous manures on the hay yield. Lucerne belongs to the family of leguminosæ, all the members of which are capable of extracting the nitrogen of the air. So far as is known, this power of utilizing the nitrogen of the air is exclusively possessed by this class of plants. For this reason peas, beans, clover, lucerne, and other such plants are used as much as possible in building up a rotation which will conserve the fertility of the soil.

The curious wart-like nodules found on the roots of healthy lucerne, peas, beans, vetches, and clover plants are really colonies of bacteria

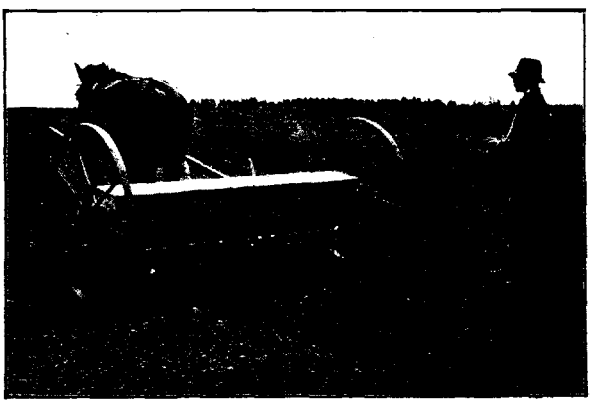

Fig. 3.—View of Lime Spreader Applying Lime to Land prior to Sowing Down with Lucerne.

engaged in the work of assimilating free nitrogen from the soil air, and transforming it into forms suitable for absorption by the plants. It is usually considered unnecessary to add nitrogenous manures to leguminous crops, even though the soil be naturally poor in nitrogen. If nitrogenous manures are applied to these crops they will make use of it, and correspondingly less nitrogen will be absorbed by the bacteria.

The question that concerns the farmer is whether the application of nitrogenous manures is a profitable practice. Whatever may be said of the policy of using nitrogenous manures on lucerne, the results at Werribee suggest that the practice is profitable.

Compare, *e.g.*, Plot 4 with Plot 9. Both plots have a uniform dressing of lime and super, but Plot 4 has, in addition, a dressing of 1 cwt. of nitrate of soda. The increase in yield due to this dressing is 19½ cwt., an increase worth 48s. 9d. per acre, and obtained by expending an additional 15s. in nitrate of soda.

A similar result is obtained on Plot 1, which received a dressing of blood manure, in addition to super and lime. Here the increase was 19.3 cwt. over Plot 9, an increase worth 48s. 3d. per acre, obtained by an added expenditure of 5s. per acre.

4. *Stable Manure.*—Observe also the results from stable manure. Ten tons of stable manure gave practically the same effect as a combined dressing of 2 cwt. of super and 1 cwt. of nitrate of soda. Its effects are more likely to persist than the other nitrogenous manures, and its effects should be noticed for some years.

Plot 3 should really, however, be compared with Plot 6. Lime alone gave a total yield of 8 tons 10.6 cwt. The addition of 10 tons of stable manure resulted in an increase of 2 tons 2 cwt. per acre, worth £5 5s. As the labour involved in its production would not exceed 2s. 6d. per ton, the net profit per acre is at least £2 5s.

Stable manure has an additional advantage over the other manures applied. It is bulky, and when applied in winter as a top dressing and

Fig. 4.—View of Lucerne Spring-tooth Cultivator at Work, State Research Farm, Werribee.

cultivated in it helps to prevent surface caking, and thus acts as a mulch as well as permitting the air and water to penetrate the soil.

Lucerne Makes a Heavy Drain on the Soil.

Even if the results of manurial tests were not available, a moment's reflection on the quantity of nutrients removed from the soil by a lucerne crop would suggest the possible advantage of liberal dressings of manures, particularly phosphates. In considering the quantity of plant nutrients removed by a lucerne crop, we will suppose that the whole of the crop is removed in the form of hay. Under these circumstances Plot 11, yielding 7 tons 17½ cwt. per acre, would remove the following nutrients per acre:—

Nitrogen, 321 lbs. per acre.
Potash, 348 lbs. per acre.
Phosphoric acid, 65 lbs. per acre.
Lime, 349 lbs. per acre.

Now contrast this with the amount removed by a 30-bushel wheat crop. If the grain is carted off the farm, and the straw burnt *in situ*, or ploughed in, a 30-bushel crop of grain will remove—

Nitrogen, 34 lbs.
Potash, 9.3 lbs.
Phosphoric acid, 14.2 lbs.
Lime, 2 lbs.

These figures should give some idea of the tremendous foraging power of lucerne. The worst plot on the Experimental Field at Werribee in two years removed from the soil—

9 times as much nitrogen as a 30-bushel wheat crop.
36 times as much potash as a 30-bushel wheat crop.
172 times as much lime as a 30-bushel wheat crop.
4.5 times as much phosphoric acid as a 30-bushel wheat crop.

Now, experience has shown that wheat lands are generally deficient in phosphoric acid, and that superphosphate must be sown with the seed if profitable crops are to be reaped. What then must we say of a crop which uses up every two years enough phosphoric acid to supply the needs of nearly five 30-bushel wheat crops? And since phosphoric acid is the most deficient plant food in our Australian soils, it follows that the fertilizers applied should contain a substantial amount of phosphates.

There are now very few wheat farmers in Victoria who fail to apply phosphatic manures with every crop of wheat they sow. Experience has taught them that phosphates are absolutely essential for successful cropping. How much more essential should it be to apply an occasional dressing of phosphates to an established lucerne crop, grown in many cases on worn out wheat lands.

It will be seen, too, that lucerne makes a heavy drain on the potash supplies of the soil. Victorian soils, however, are generally well supplied with potash, and the average wheat soil contains at least 2 per cent., or 7,000 lbs. of potash for each acre-foot of soil. The subsoils are even richer. Only a small portion (possibly not more than 1 per cent. of the total potash in the soil) is available for the use of the crop at any given moment. The use of such soil amendments as lime, gypsum, and ground limestone, helps to liberate some of the insoluble phosphates and potash of the soil, and this explains the increased returns of lucerne following the use of dressings of lime.

Regarding the nitrogen supply, the lucerne plant is, of course, able to draw on the supplies of nitrogen from the air, and probably the greater part of the nitrogen gathered by the plant comes from this source. Of course, if the whole of the crop is removed in the form of hay, then the drain on the nutrients of the soil is considerable. If the lucerne is grazed, however, or consumed on the farm by live stock and the droppings returned as top dressings, approximately one-third to one-half of these nutrients are returned to the soil, the balance being utilized to maintain the animals, and build up muscle, flesh, and bone.

These figures are certainly striking, and they explain why old lucerne fields are so productive for some years after their renovation. It is particularly noticeable on the irrigation settlements, where old lucerne fields are broken up and sown with forage and grain crops prior to re-sowing down with lucerne. The large quantities of nutrient material

particularly nitrogen, accumulated by the lucerne roots during the time it occupied the ground, are gradually made available to these crops. This reserve of plant food, together with the amount normally supplied by the soil, is sufficient to provide for the demands of the heaviest crops. Crops like sorghum, ambercane, imphee, maize, &c., grow particularly well.

One other point needs to be mentioned. Most farm crops secure their mineral nutrients from near the surface. Lucerne, on the other hand, can penetrate the soil to a great depth. At Bacchus Marsh and Tamworth the roots have been traced to a depth of 30-35 feet.

Near Tamworth, New South Wales, many old paddocks of lucerne have been undermined by the eroding action of the Peel and the Cockburn rivers, and the root system to a depth of 30 feet exposed to full view.

Though the total amount of plant food removed per acre by lucerne is considerable, it must be borne in mind that a goodly quantity of this material is gathered from regions inaccessible to the roots of ordinary farm crops.

The reader will see that the lucerne crop makes a heavy drain on the mineral constituents of the soil. He may infer that lucerne is an ex-

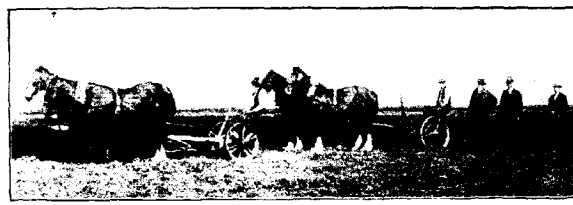

Fig. 5.—Cutting Crops on Lucerne Manurial Plots, State Research Farm, Werribee.

hausting crop, and that its continual growth will deplete the soil of its fertility. There is no doubt that lucerne, as compared with cereal crops, does make heavy calls on the soil; but the old adage "One cannot eat the cake and have the cake" applies here. A large crop of high nutritive value cannot be produced without removing from the soil large quantities of plant food.

The amount of plant food removed from the soil by any given crop is, roughly, proportionate to the size of the crop. The skilful cultivator endeavours to raise as big a crop as possible, and recognises that the larger the crop, the more the necessity for replacing some of the nutrients removed by the crop.

Large Amount of Plant Food Stored Up in Lucerne Roots.

It may be of interest in passing to briefly indicate the amount of plant food stored up in the lucerne roots. A number of lucerne plants were grown at Rutherglen during 1914-15 in deep pots to gather information as to the ratio of root development to overhead growth, and the amount of plant food stored up by the roots.

It was found as an average of a number of tests that the root growth was equal to 22 per cent. of the overhead development. The average composition of the roots was—nitrogen, 2.1 per cent.; phosphoric acid, .5 per cent.; potash, 1.1 per cent.; and lime, 1.2 per cent. Applying these results to the unmanured plot mentioned above, the total weight of roots formed during the two years would be equal to 47 cwt. of dry roots and root hairs per acre. Hence, there would remain in the roots of this crop—

Nitrogen, 69.2 lbs.
Phosphoric acid, 16.2 lbs.
Potash, 36.0 lbs.
Lime, 39.6 lbs.

These figures will give some idea of the enormous foraging power of the root system of lucerne.

Fig. 6.—Curing Hay on Lucerne Manurial Plots, State Research Farm, Werribee.

The Wonderful Foraging Power of Lucerne.

In other words, during the space of two years the unmanured plot of lucerne took from the soil enough phosphoric acid to supply the needs of five 30-bushel wheat crops, and left behind in its roots more than enough of the same ingredient to bring a 30-bushel crop to maturity. It took from the soil in two years enough nitrogen to supply nine 30-bushel wheat crops, and it left behind in its roots enough nitrogen for more than *two* such crops.

Finally it removed potash in two years sufficient to supply thirty-six wheat crops, and at the same time there was enough left in its roots to furnish potash for *four* wheat crops.

Time and Manner of Applying Fertilisers.

The most suitable time to apply top dressings to established lucerne is in August, just before the soil temperatures begin to rise. The lucerne may be grazed with sheep towards the end of July, or early in August, if the soil is dry enough to carry them without puddling the

surface. The sheep will clean up all weeds and crop the lucerne fairly close. After the sheep are removed, the cultivator should be run over the lucerne, and the tines of the cultivator allowed to work to a fair depth.

There are many types of lucerne cultivators on the market. The ideal machine is one that is light of draught, stirs the soil to a good depth, and does the minimum of damage to the lucerne. On the whole, the spring-tooth cultivator fulfils these conditions fairly well. In Fig. 4 is a view of a lucerne cultivator at work on a 50-acre field of lucerne at the State Research Farm, Werribee. The lucerne depicted in the illustration was closely grazed with sheep and then deeply cultivated in two directions at right angles early in August. This permits access of air to the lucerne roots and puts the soil in good condition for absorbing the spring rains. The artificial fertilisers may then be applied with

Fig. 7.—Carting Produce of Lucerne Manurial Trials to the Weighbridge.

the drill. Lime is most conveniently applied with a lime spreader (*vide* Fig. 3), and is best applied by itself a week or so before the application of phosphatic fertilisers.

Summary.

The results of tests conducted at the State Research Farm, Werribee, during the past two years demonstrate that the yields of lucerne hay may be considerably increased by the application of suitable fertilisers.

(1) Lucerne sown without manure gave in two years a total yield of 7 tons 17½ cwt. of commercial hay.

(2) Lime applied at the rate of 1 ton of lime per acre, or its equivalent in the form of ground limestone, enabled crops of 8¼ tons to be reaped—an increase of 13 cwt.—which was sufficient to cover the cost of the manure.

(3) The addition of phosphates, no matter whether in the form of super, basic slag, or bone dust, enabled the limit of production to be raised to 9 tons 13 cwt.—an increase of 35 cwt.—which was very profitable.

(4) Of all the phosphatic manures super was the most effective. It was almost as effective applied by itself as when applied in conjunction with lime.

(5) There is no manure that is likely to give the lucerne grower such substantial and profitable results as the dressing of 2 cwt. of super applied every two years. For an outlay of 10s. per acre (Plot 12) an increase of 35 cwt. was secured, valued at £4 7s. 6d.

(6) The addition of nitrogenous manures, combined with super and lime, enabled the limit of production to be raised to 10 tons 12½ cwt., an increase of 2¾ tons as compared with the no-manure plot.

(7) Despite the fact that the lucerne can secure nitrogen from the air, the tests show that, on Werribee soils, the application of nitrates is likely to be a profitable practice.

(8) Stable manure in dressings of 10 tons per acre is a most valuable manure for lucerne, especially on worn-out soils, such as those at Werribee. Not only does it give as good a return as a combination of super and nitrate of soda, but it helps to keep the soil open and acts as a mulch.

(9) Lucerne makes a heavy drain on the mineral constituents of the soil. The unmanured plot of lucerne at Werribee in two years removed from the soil 4½ times as much phosphoric acid, 9 times as much nitrogen, and thirty-six times as much potash as a 30-bushel wheat crop. This alone, apart from a consideration of the actual results of tests, is sufficient to suggest to the farmer the need for liberality in applying artificial fertilisers.

(10) Lucerne also leaves in the soil large quantities of mineral food gathered from the regions beyond the reach of ordinary farm crops. In two years the unmanured lucerne plot had stored up in its roots enough phosphoric acid to supply the need of a 30-bushel wheat crop, enough nitrogen for two such crops and enough potash for four such crops. That is the reason why cereal and fodder crops thrive so well on soil that had been sown to lucerne for a number of years.

(11) It is suggested that the lucerne fields be grazed in winter, cultivated with a spring-tooth cultivator, and top-dressed, either with 2 cwt. of super every two years, or with 1 cwt. of super per acre every winter.

Cereal farmers never fail to apply phosphates to their cereal crops. At the present time, very few lucerne growers top-dress their lucerne fields with artificial manures. The Werribee results show that there would be a handsome profit in the practice.

EXPERIMENTS IN THE CULTIVATION OF POTATOES, 1915-1916.

By J. T. Ramsay, Potato Expert.

The following report and comment, relative to the experimental work in potato cultivation conducted by the Department during the season 1915-16, is submitted herewith:—These tests were carried out at three different centres, viz., Leongatha, Koo-wee-rup, and Portland, and were designed and undertaken with the object of getting practical demonstration of the effects of varying treatments of the crop, the best of which are feasible of adoption into the farm practice of growers for the benefit of their soils, their crops, and their pockets. The climatic conditions governing the crop of the season were extreme in their variations. The genial weather experienced at planting time proved to be the start of a period of drought which lasted over two months. During this time the thorough preparatory and inter-cultivation which was given to the plots was severely tried in its counteraction to the baneful effects of a distressing sequence of dry days which were unpleasantly and consistently favoured by an abundance of moisture-stealing winds.

This spell of drought was particularly favorable to the spread of the notorious Rutherglen Bug (*Nysius Vinitor*) which made its appearance at Leongatha about the middle of January, and threatened the crop with destruction.

Fortunately its advent was noticed and steps combative to it were immediately taken. Numerous smudge fires made from waste straw, bagging, &c., were set burning in such positions as would allow the wind to carry the smoke over the crop, and to each fire was added a handful of sulphur. The result was effective. The whole area treated was soon enveloped with the pungent and suffocating smoke, which had the effect of either killing or driving off the insects. No further visitation of this pest was experienced.

Good rains fell during the third week in January, and improved the aspect. The crop responded and was favoured with genial climatic environment for the remainder of the maturation period.

LEONGATHA.

At Leongatha an area of 5½ acres was subdivided into seven sections which had objectives as follows:—

1. The effect on the crop of phosphatic, potassic, and nitrogenous manures in varying combinations, and at varying rates of application per acre.
2. The effect of dipping seed in an antiseptic solution, and spraying the crop with a fungicidal preparation, as disease preventives.
3. The effect on the yield of varying depths of planting the seed.
4. The effect on the yield of varying spacings between the sets.
5. The respective influences on the yield of immature and ripe seed.
6. The cropping capabilities of different varieties.
7. The propagation of new varieties.

Planting was finished on this area on 17th November, 1915. The soil, in which these tests were made at Leongatha, is a grey loam, which is very deficient in phosphoric acid and potash, as is shown by the analysis.

ANALYSIS OF LEONGATHA SOIL.

Parts per 100,000.

—	Soil.	Subsoil.	For comparison, a Good Soil should contain—
Nitrogen	157	87	150
Phos. Acid	45	70	150
Potash	58	35	250
Lime	136	204	500
Magnesia	112	84	Not more than lime
Chlorine	14	12	Not more than 35
Reaction	Acid	Acid	Neutral to slightly alkaline

The following tables give the results obtained in the different sections:—

SECTION 1.—MANURE TESTS.

—	Tons per Acre.			Increase, due to Manure.		
	tons	cwt.	lbs.	tons.	cwt.	lbs.
1. No manure (average of four Sections)	3	7	56	..		
2. 3 cwt. Super.	5	15	0	2	7	56
3. 3 cwt. Basic Phosphate	5	5	0	1	17	56
4. 3 cwt. Blood and Bone	4	5	0	0	17	56
5. 3 cwt. Potato Manure	4	7	56	1	0	0
6. 1 cwt. Sulphate of Potash, 3 cwt. Blood and Bone ..	4	17	56	1	10	0
7. 1 cwt. Sulphate of Potash, 3 cwt. Super.	5	10	0	2	2	56
8. 3 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	5	15	0	2	7	56
9. 3 cwt. Super., 1 cwt. Sulphate of Potash, 2 cwt. Blood ..	6	8	84	3	1	28
10. 6 cwt. Super., 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia	9	7	56	6	0	0
11. 9 cwt. Super., 3 cwt. Sulphate of Potash, 3 cwt. Sulphate of Ammonia	10	2	56	6	15	0

In every case an increased weight of the crop was obtained from the application of manures, and the amount of the increase was fairly proportionate to the amount of manure applied. Some doubt was expressed at the beginning of the season as to whether the fairly heavy dressings of 9 cwt. and 15 cwt. applied to sub-sections 10 and 11 respectively, would prove profitable. The following table, which expresses the results of these manurial trials in money values, settles this doubt.

In computing, the values of the manures used, have been taken at the rates per cwt. shown hereunder:—

Superphosphate, 4s. 6d.; sulphate of potash, 14s.; sulphate of ammonia, 16s.; blood and bone, 7s.; basic phosphate, 4s.; potato manure, 6s. 6d.; blood, 6s. 9d.

The value of the crop has been reckoned at £5, a rate which must be admitted moderate when the prices of the past two seasons are considered.

RESULTS OF MANURE TESTS IN MONEY VALUES.

Rates per acre.

—	Gross Value at £5 per Ton.	Cost of Manure.	Cash Increase, after paying for Manure.
	£ s. d.	£ s. d.	£ s. d.
No Manure	16 17 6	..	..
3 cwt. Super.	28 15 0	0 13 6	11 4 0
3 cwt. Basic Phosphate	26 5 0	0 12 0	8 15 6
3 cwt. Blood and Bone	21 5 0	1 1 0	3 6 6
3 cwt. Potato Manure	21 17 6	0 19 6	4 0 6
1 cwt. Sulphate of Potash, 3 cwt. Blood and Bone ..	24 7 6	1 15 0	5 15 0
1 cwt. Sulphate of Potash, 3 cwt. Super.	27 10 0	1 7 6	9 5 0
3 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	28 15 0	2 3 6	9 14 0
3 cwt. Super., 1 cwt. Sulphate of Potash, 2 cwt. Blood ..	32 3 9	2 1 0	13 5 3
6 cwt. Super., 1½ cwt. Sulphate of Potash, 1½ cwt. Sulphate of Ammonia	46 17 6	3 12 0	26 8 0
9 cwt. Super., 3 cwt. Sulphate of Potash, 3 cwt. Sulphate of Ammonia	50 12 6	6 10 6	27 4 6

These figures should be more than interesting to potato growers.

In every case there is shown a cash increase after paying for manure, and, here is the strongest possible evidence of the fact that the more liberal the expenditure on suitable manures, the bigger is the margin of profit which accrues.

Not many growers in the State apply dressings up to the heavier weights tested at Leongatha. Yet these figures, and those of last year, show that where soil is deficient in the necessary quantity of plant food. *liberal manuring is a sound investment which returns a handsome interest.* The building up of fertility by manuring increases land values per acre, by increasing its potential productiveness.

SECTION 2.—DIPPING AND SPRAYING TEST.

In this section the variety "Up-to-date" was subjected to the treatments indicated in the accompanying table. All the seed used was taken from one parcel, and was clean. The dipping solution for seed was made from 1 oz. of corrosive sublimate to 6 gallons of water and the seed was immersed in this for one and a half to two hours. The spraying solution was made from copper sulphate, 2 lbs.; washing soda, 2½ lbs.; to 10 gallons of water. Under all treatments the resulting crop was clean so that the test for this season has no practical value.

The following weights were recorded, which show variations insufficient for remark:—

	tons	cwt.	lbs.
Dipped at Planting, and Sprayed	5	13	8
Dipped at Digging, and Sprayed	5	2	96
Dipped at Planting, not Sprayed	5	6	8
Dipped at Digging, not Sprayed	5	7	4
Sprayed only	5	11	8
Untreated	4	17	96

Section 3.—Depth of Planting Test.

In this test the shallower planted sets, viz., 3 inches and 3½ inches, came away most quickly at the beginning of the season, but were more severely affected by the long spell of dry weather, and consequently finished with a lighter crop than those planted at depths of 4 inches and over.

The figures resulting from the various depths indicate that 4 inches to 5 inches were the most suitable for this season. This test will be repeated.

Depth of Planting Test.

	tons	cwt.	lbs.
3 inches deep	2	14	0
3½ inches deep	3	15	0
4 inches deep	4	16	8
4½ inches deep	4	12	96
5 inches deep	5	2	96
6 inches deep	4	10	40

Section 4.—Spacing Test.

Four spacings were used in this section, viz., 12 inches, 15 inches, 18 inches, and 21 inches, and the results bear out the expectation that the closer plantings would produce the heavier yields. Besides yielding the heavier tonnage, the tubers from the closer spacings were of a more even size than those grown at 18 inches to 21 inches apart. In many parts of the State growers are inclined to be too sparing in the use of seed, some making a practise of using as little as 7 cwt. to seed an acre of ground. This is undoubtedly a mistake. When sets are placed, say, 20 inches apart in the rows, the tendency is for the tubers produced to be too large and coarse. Thicker seeding produces heavier tonnages of better quality potatoes. This is borne out by the fact that the competitors who score highest in the field crop competitions are those who use fair-sized seed sets and plant them closely.

The following weights were obtained from the various spacings:—

Spacing Test.

	tons	cwt.	lbs.
12 inches apart, x rows 2 ft. 3 in.	6	1	8
15 inches apart, x rows 2 ft. 3 in.	5	9	32
18 inches apart, x rows 2 ft. 3 in.	4	18	64
21 inches apart, x 2 ft. 3 in.	4	16	88

Section 5.—Immature *v.* Ripe Seed.

The seed used in this section was saved from the previous season's crop at Leongatha. Seven varieties were subjected to the trial. In the case of each variety the seed was secured at two stages of the growth of

the plants:—1. *Before* the crop was ripe, and, 2, *after* the crop had ripened. Both classes of seed were subjected to the same cultural treatment and were planted side by side.

The weights recorded in each case are tabulated below:—

IMMATURE AND RIPE SEED TEST.

Variety.	Immature.	Ripe.	Increase, due to Immature Seed.
	tons cwt. lbs.	tons cwt. lbs.	tons cwt. lbs.
Sutton's	7 0 0	5 0 0	2 0 0
Factors	6 0 0	5 0 0	1 0 0
White Elephant	11 14 0	10 3 94	1 10 18
Carman I.	7 4 89	4 0 80	3 4 9
Early Norther	3 17 86	2 17 16	1 0 70
Black Prince	6 12 103	4 8 64	2 3 39
Gold Coin	4 19 70	3 16 88	1 2 94

It will be seen that there is a marked increase in favour of immature seed.

The increases vary from 1 ton per acre in the case of the "Factor" variety, to 3 tons 4 cwt. in the case of Carman I., *but the increase is constant* through all the varieties.

The accompanying table shows the relative cash returns per acre of the crops grown from immature and ripe seed:—

CASH VALUE OF CROP PER ACRE AT £5 PER TON.

Variety.	Immature.	Ripe.	Increase, due to Immature Seed.
	£ s. d.	£ s. d.	£ s. d.
Sutton's	35 0 0	25 0 0	10 0 0
Factors	30 0 0	25 0 0	5 0 0
White Elephant	58 10 0	50 18 9	7 11 3
Carman I.	36 3 9	20 3 9	16 0 0
Early Norther	19 8 9	14 3 6	5 2 3
Black Prince	33 5 0	22 2 6	11 2 6
Gold Coin	24 17 6	19 3 9	5 13 9

The smallest increase in value per acre is £5, and the greatest £16, both being appreciable. The average of the seven varieties in yield per acre and money value of crop is given herewith.

AVERAGE RETURNS OF SEVEN TESTS OF IMMATURE AND RIPE SEED.

	Immature.	Ripe.	Increase per Acre, due to Immature Seed.
	tons cwt. lbs.	tons cwt. lbs.	tons cwt. lbs.
	6 15 65	5 1 1	1 14 64
	£ s. d.	£ s. d.	£ s. d.
At £5 per ton	33 18 0	25 5 0	8 13 0

Nothing could be more convincing in proving the super-efficiency of immature seed as compared to ripe seed. The limit of argument should be reached when the subject is discussed in money values.

This result confirms the result of last year's demonstration, and confirms the result obtained in every case where immature and ripe seed are tried together.

It is gratifying to know that some of the leading growers in the State have adopted the practice of using immature seed and it should only be a matter of time before the rank and file have the superior worth of this class of seed driven home to them with sufficient force to cause them to follow the lead. There is no risk about the matter, it is beyond the experimental stage, it is a hard and definite fact that immature seed must be used if the heaviest crops are to be produced.

SECTION 6.—VARIETY TESTS.

The following are the varieties which yielded the heaviest crops at Leongatha this season:—

	tons	cwt.	lbs.
White Elephant	11	14	0
Windsor Castle	8	14	0
Carman I	7	14	89
Sutton's Abundance	7	0	0
Black Prince	6	13	0
Up-to-date	6	1	0
Factors	6	0	0
Brown River	5	5	23
Peach Bloom	5	3	4
Gold Coin	4	19	70

SECTION 7.—NEW VARIETIES.

This year thirty-eight new varieties were tested. These were grown from seed supplied to this Department by Dr. Wilson, of St. Andrew's University, Scotland. Out of the thirty-eight sixteen produced crops of over 5 tons to the acre, and it is intended to further propagate these, and make the best of them available to growers. There are a number of them which give promise of being well worthy of inclusion amongst the varieties commercially grown in this State.

KOO-WEE-RUP.

At this centre an area of 2 acres was devoted to experimental work in the field cropping of potatoes. These were planted on 21st October, 1915. The objectives in this case were:—

1. Manurial tests.
2. Prolificacy of different varieties.
3. Normal seed *versus* weak seed.
4. Immature *v.* ripe seed.

The results obtained from the different manures at Koo-wee-rup varied in such an irregular manner as to render them of no value, therefore space will not be given to their tabulation. The only conclusion that could be drawn from them is that the fertility of the soil on the area planted varied, for some reason or other, to such an extent as to prevent the effect of the various dressings being distinguishable. The crops produced in sections 1, 3, and 4 are of some value, as these tests extended over all manures, and the results are therefore reported here.

Section 2.—Variety Tests.

In this case five varieties were tested with the following results for the area planted:—

	tons	cwt.	lbs.
Adirondak	10	0	56
Factors	6	17	0
Carman I.	5	3	0
Cook's Favorite	4	18	56
Manistee	4	17	0

Section 3.—Normal Seed *v.* Weak Seed.

When the Carman potatoes were being cut for planting it was decided to make a test between sets showing weak shoots and those with normally strong buds. The two classes of seed were planted side by side. From the time they came through the ground there was visible evidence that the sets with weak shoots were handicapped, and when the crop was dug this was supported by the weights recorded; these being:—

	tons	cwt.	lbs.
Normal Buds	7	12	77
Weak Buds	5	12	98

This makes practically a 2-ton to the acre difference in favour of the portion planted with sets showing fair strength in their shoots, and emphasises the advisability of discarding at planting time sets or tubers which show any evidence of lack of vigour.

Section 4.—Immature *v.* Ripe Seed.

The Factor variety from Leongatha was used in this test at Koo-wee-rup. Ripe and immature seed of this variety were planted side by side with the following result:—

	tons	cwt.	lbs.
Immature Seed	7	17	56
Ripe Seed	6	17	0
Increase, due to Immature Seed	1	0	56

PORTLAND.

On the heath country at Cashmore-Portland experiments were carried out on two classes of soil, viz., "Hill" land, which takes its name from the fact that it is characteristic of the soil found on the higher parts of the undulations of the heath, and "Flat" land, so called because it is typical of the class of soil prevailing on the lower levels. Of the two soils the "Hill" land appears, to ocular observation of the uninitiated, to be the richer of the two, but, chemical analysis shows it to be but little different to the "Flat" land, in its content of plant food. Its cropping power up to the present has proved a dead loss, on account of the fact that no treatment of it has yet been found effective in making it produce any crop adequate to the expenditure involved in its production. No reason can be given here for this phenomenon. It

is possible that further cultivation, *i.e.*, working of this land may make it productive. Further analysis of it is being made now to determine whether it contains anything toxic to plant life. The "Flat" land has always proved responsive to manurial treatments. This is a grey, sandy soil of such a physical texture as permits it to be worked with ease at any season of the year, and it is well suited to the cultivation of potatoes and other root crops.

The analyses of the two classes of soil are given herewith:—

ANALYSIS OF CASHMORE HEATH "HILL LAND."

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	118	72
Phos. Acid	11	8
Potash	16	9
Lime	82	62
Magnesia	86	66
Chlorine	8	8
Reaction	Acid	Acid

ANALYSIS OF CASHMORE HEATH "FLAT LAND."

Parts per 100,000.

—	Soil.	Subsoil.
Nitrogen	109	35
Phos. Acid	13	10
Potash	17	17
Lime	122	54
Magnesia	99	67
Chlorine	8	8
Reaction	Acid	Acid

Both analysis show a moderate content of nitrogen, but a great shortage in the necessary proportions of phosphoric acid and potash.

The objects aimed at in conducting these tests were:—

1. The relative efficiency of various manures.
2. Prolificacy of varieties.
3. Immature *v.* ripe seed.

Planting was completed at Cashmore on the 29th November, 1915, and the plots were harvested on the 9th June, 1916.

The results of the tests on the "Flat" land are given herewith:—

SECTION 1.—"FLAT" LAND.

Manure Tests—Un-Limed Portion.

Average of all varieties.

—	—	Value per Acre, at £5 per Ton.
	tons cwt. lbs.	£ s. d.
1. No Manure	1 15 0	8 15 0
2. 4½ tons Stable Manure	7 0 0	35 0 0
3. 4 cwt. Potato Manure	5 0 0	25 0 0
4. 4 cwt. Blood	2 15 0	13 15 0
5. 4 cwt. Blood and Bone	3 5 0	16 5 0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash	4 10 0	22 10 0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	5 10 0	27 10 0
8. No Manure	1 15 0	8 15 0
9. 6 cwt. Super.	4 15 0	23 15 0
10. 4 cwt. Super., 1 cwt. Sulphate of Potash, 1 cwt. Sulphate of Ammonia	6 5 0	31 5 0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	4 15 0	23 15 0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	5 15 0	28 15 0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sulphate of Potash	8 15 0	43 15 0
14. No Manure	1 15 0	8 15 0

A remarkable result obtained here is the large increase in the crop caused by the application of a very small dressing of stable manure of 4½ tons to the acre. The crops grown on the plots treated with phosphoric acid and potassic manures also showed a marked increase thereby demonstrating the need of such manures in this soil. On the limed sub-section the results of which follow, similar increases were harvested, which further proves the responsiveness of this land to manuring. The application of lime at the rate of 1 ton per acre gave no noticeable results this season, probably due to the fact that it was applied somewhat late. *Its effect will probably be marked in next year's crop.*

MANURE TESTS—LIMED PORTION.

—	—	Value per Acre, at £5 per Ton.
	tons cwt. lbs.	£ s. d.
1. No Manure	1 15 0	8 15 0
2. 4½ tons Stable Manure	6 15 0	33 15 0
3. 4 cwt. Potato Manure	4 15 0	23 15 0
4. 4 cwt. Blood	3 0 0	15 0 0
5. 4 cwt. Blood and Bone	3 15 0	18 15 0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash	4 5 0	21 5 0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	5 5 0	26 5 0
8. No Manure	1 15 0	8 15 0
9. 6 cwt. Super.	4 5 0	21 5 0
10. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 1 cwt. Sulphate of Potash	6 0 0	30 0 0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	5 10 0	27 10 0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	7 15 0	38 15 0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sulphate of Potash	8 5 0	41 5 0
14. No Manure	1 15 0	8 15 0

These results give a glaring example of the effectiveness of manuring on this class of soil. In order that this may be the more clearly demonstrated the following tabulation of the net cash increases in the value of the crop under the various manurings is given:—(Rate per ton £5).

TABLE SHOWING CASH INCREASES PER ACRE DUE TO MANURING.

	Cost of Manure per Acre.	Cash Increase after Paying for Manure.
	£ s. d.	£ s. d.
1. No Manure	..	..
2. 4½ tons Stable Manure	2 5 0	24 0 0
3. 4 cwt. Potato Manure	1 6 0	14 9 0
4. 4 cwt. Blood	1 6 0	3 14 0
5. 4 cwt. Blood and Bone	1 8 0	6 2 0
6. 4 cwt. Blood and Bone, 1 cwt. Sulphate of Potash	2 2 0	11 13 0
7. 2 cwt. Basic Phosphate, 2 cwt. Blood, 1 cwt. Sulphate of Potash	1 15 0	17 0 0
8. No Manure	..	..
9. 6 cwt. Super.	1 7 0	13 13 6
10. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 1 cwt. Sulphate of Potash	2 8 0	20 2 0
11. 4 cwt. Super., 1 cwt. Sulphate of Ammonia	1 14 0	13 6 0
12. 4 cwt. Super., 1 cwt. Sulphate of Potash	1 12 0	18 8 0
13. 4 cwt. Super., 1 cwt. Sulphate of Ammonia, 2 cwt. Sulphate of Potash	3 2 0	31 18 0
14. No Manure	3 2 0	31 18 0
	..	..

SECTION 2.—VARIETY TESTS.

Six varieties subjected to the same treatment were grown side by side. These produced the recorded weights:—

	tons	cwt.	lbs.
Brownell's Beauty	5	11	8
Up-to-date	5	4	72
Sutton's Abundance	5	17	56
Scruffie	3	7	16
Clark's Main Crop	6	0	0
Early Norther	4	1	8

All of these turned out a fine sample, and were clean and free from disease.

SECTION 3.—IMMATURE *v.* RIPE SEED.

As at Leongatha and Koo-wee-rup the Cashmore test of these two classes of seed was strong in its proof of the profitableness of using immature seed. The variety used was Sutton's Abundance, grown last season at Leongatha.

The crop resulting was:—

	Per Acre. tons	cwt.	lbs.
Immature Seed	5	13	14
Ripe Seed	2	5	0
Increase, due to Immature Seed	3	8	14

This expressed in money means that every acre grown from immature seed under the Cashmore conditions of 1915-16 (with potatoes at £5 per ton) would be worth £17 1s. 3d. more than that grown from ripe seed—surely enough evidence of its value to induce growers to use it.

APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

The Apple (*Pyrus Malus*).

For many centuries the apple has been the most extensively grown, universally popular, prolific, and profitable of our cultivated commercial fruits.

It belongs to the natural order *Rosaceæ*, and is capable of adapting itself to a wide range of soil and climatic conditions, consequently it is cultivated in all the civilized countries of the world.

During the long period throughout which the apple has been in use, and, compared with other fruits, it has had no equal as a tonic, food and blood purifier.

Since the apple was introduced into Victoria the area under its cultivation has steadily increased from year to year until its production has become one of our chief national industries.

A ripe apple contains acid, sugar, fat, lime, phosphorus, protein, carbohydrates, magnesia, &c. The proportions, beautiful combinations, and blending of these chemicals, as in the apple, constitute a food which is procurable only through Nature's dispensary.

When writing of the apple in England, Hogg states:—"There is no fruit in temperate climates so universally esteemed and so extensively cultivated, nor is there any which is so closely identified with the social habits of the human species as the apple. Apart from the many domestic purposes to which it is applicable, the facility of its cultivation and its adaptation to every latitude have rendered it in all ages an object of special attention and regard. There is no part of our island where one or other of its numerous varieties are not cultivated, and few localities where the fruit cannot be brought to perfection. The apple is a native of this, as well as almost every other country in Europe. Its normal form is the common Wild Crab *Pyrus Malus* of Linnæus, and the numerous varieties with which our gardens and orchards abound are the result either of the natural tendency of that tree to variation, or by its varieties being hybridized with the original species or with each other."

During the eighteenth and nineteenth centuries the varieties have been considerably increased in number, and point of size and quality much improved, not only by means of interpollination and the consequent cross-fertilization of selected varieties, but also by the propagation of chance seedlings and "sports," and by careful cultivation and general good management.

As the early ripening varieties now grown lack not only quality, but perish in a remarkably short time, it is the duty of horticulturists of the present day to win from Nature's inexhaustible store the apple that is desired.

There is a good supply of mid-season and late ripening sorts suitable for oversea and Inter-State markets.

While in search of the early varieties, others might be found which would thrive better under warm soil and climatic conditions, irrigation, &c., than some of those at present grown. In addition, also, if a variety resistant to black spot (*Fusicladium dendriticum*) and bitter pit could be evolved, incalculable benefit would be bestowed on the fruit-grower.

Most kinds of fruits have to be consumed when in season because they keep, as fresh fruit, only a few weeks or, in some instances, even a few days. They may, however, be preserved or converted into by-products, but apples can be kept much longer fresh than most other fruits, even under ordinary conditions. But since the advent of cool storage they may even be kept as fresh fruit all the year round, and the surplus converted into many valuable commercial by-products as well, viz., dried apples, cider, jelly, spirit, pomade, &c. Apples are also largely used in the manufacture of jams.

Plate 1.—Ploughing and Subsoiling.

Plate 2.—Subsoil Plough.

The present, and perhaps the immediate future are ours, therefore all persons interested in apple culture should become, if not already active students of pomology, so that they may learn and practise all the essentials to scientific and successful apple culture, and thus be in a position to hand down to the next generation the apple with possible improvements on its useful and glorious past.

When the Commonwealth Industrial Research Bureau is being established it might include a few original scientific investigators, thoroughly equipped, to further explore the regions of horticultural research.

The Government of Victoria has taken steps to instruct returned soldiers who wish to take up fruit growing as their future occupation at the Dookie College, and the Department of Agriculture is desirous that the Orchard Supervision Branch should work in harmony and co-operation with the officers of the college in this regard.

It is realized that the soldiers will have to fight an uphill battle until their orchards come into bearing.

These articles are intended to be of some service, so that the nucleus of our new horticultural army may be equipped with practical and reinforced with scientific knowledge to enable it to successfully attack any Anzac barriers that may arise between itself and successful fruit growing.

It is proposed to include all the details relative to apple culture in this series of articles, with illustrations, to be published in the *Journal of Agriculture* monthly until they are completed.

Selection of Locality.

Owing to the conditions which have for some time prevailed in this State, it is desirable that the prospective apple-grower should keep in view the fact that the future of the industry depends largely upon the production of varieties suitable for export oversea. He should also become acquainted with the conditions prevailing in the localities in which these varieties thrive best.

The locality chosen should be as near as possible to the city, so as to minimize the cost of production, haulage, and railway freights.

Any person, without previous knowledge of orchard work, going into the business should select his land, if possible, in an established fruit district, where he may be able to obtain skilled labour when required on his orchard. He would then, through intelligent application to his work, be in a position to master all the details of orcharding by the time his trees came into bearing.

Site for Orchard.

When it is decided that the locality for the orchard is to be in undulating country, the site should be selected with a gradual slope to the east or north-east, and, if not naturally protected by high lands or forest growth from northerly or westerly winds, breakwind hedges should be provided. Planting on steep abrupt slopes should be avoided, as heavy rains wash away the cultivated soil from the trees and increases the cost of cultivation.

The slopes lend themselves to drainage, and the blossoms of trees growing on them are less liable to be injured by late frosts than those growing on low-lying flat lands. Slightly elevated tablelands are preferable to low valleys for this reason, as the colder air, being heavier, descends and flows down the slopes, leaving the warm and lighter air encompassing the orchard site. In the past two seasons many fruitgrowers whose orchards occupy low-lying valleys have suffered very considerably from late frosts, and, unless prepared to meet heavy expenses in taking remedial measures against them, such sites should be avoided.

Soils.

Throughout the State there are large tracts of country eminently suitable for the apple, but the deep sandy loams plentifully supplied with humus and overlying a permeable clay subsoil offer ideal conditions to the production of this particular kind of fruit. It is always to be remembered that the apple does not adapt itself to soils of a wet or sour nature, and, unless subdrainage is effectively carried out under such conditions, one cannot hope to be successful in the cultivation of the apple.

It is found by experience that the character of the soil plays a most important part, not only on the trees themselves, but also on the prolificacy and quality of the yield. Soils of granitic origin offer a genial home for the apple, where, under proper management, the trees are thrifty throughout a long series of years, yielding generous crops of fruit of excellent quality and colour. A remarkable feature of orchards established in soils of this character is the evident precocity of the trees, as it is not uncommon to gather considerable quantities of fruit three or four years after planting. Orchardists favored with this class of soil have no dread of the root-borer, which plays such sad havoc in many fruit-growing centres where the soil is suitable to its depredations, nor is the root-fungus (*Armillaria mellea*) much in evidence in soils of granitic origin.

Generally speaking, granitic soils are rich in potash, and this may account for the advantages in colour, quality, and production of orchards therein established.

Silurian soils are also much favoured by growers, and yield heavy crops of fruit of good

Plate 3. Discing Orchard Land.

quality and colour. Generally, however, in such soils the subsoil is heavier and more tenacious than the former, and require to be thoroughly under-ground drained. The root-borer is often found in this class of soil, while being entirely absent in granitic country adjoining or not far distant.

Apple orchards give less satisfaction in the red soils of Gippsland, and these should be avoided for the more favorable ones previously mentioned.

The deep siltations of river valleys yield fruit incomparably more abundantly than anywhere else, but as the tree ages its size precludes it from the economical management necessary for the suppression of pests, the harvesting of the crop, and treatment whereby the quality of the fruit is maintained.

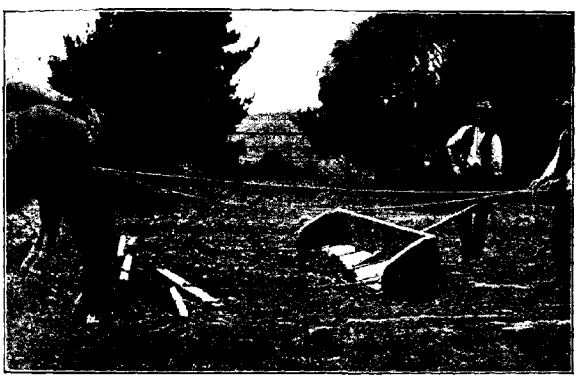

Plate 4.—Buck-scraper at Work.

The universal avoidance of basalt soils by growers throughout the State goes to show their estimation of this class of country for fruit-growing.

Climatic Conditions.

Consideration has been given to locality, site, and soil conditions, with suggestions as to how they may be made applicable to apple culture generally. However, we know that there are certain varieties which do not yield remunerative crops, no matter how perfect these conditions may be, if the climatic or atmospheric conditions do not prove congenial environments to the particular variety.

Under those adverse climatic conditions certain trees may grow to be large and healthy. They may carry a plentiful supply of apparently vigorous blooms, but the resultant fruit is usually small, sparse, and of inferior quality.

This is a phase of fruit-growing which a large percentage of those engaged in the industry have learned to their cost. Many thousands

of Munroe's Favorite, Cleopatra, Adams' Pearmain, and Nickajack trees have been grown to maturity, found wanting, and cut down in certain southern districts of Victoria owing to this cause, although they are mostly prolific bearers when cultivated north of the Dividing Range.

PREPARATION OF THE LAND.

When the preliminary essentials—locality, site, soil, and climate—have received consideration, attention should be directed to the preparation of the land.

If it is decided to plant on virgin soil, which is mostly preferable, the land, if timbered, should be cleared, and all roots carefully removed to a depth of about 2 feet. This facilitates deep ploughing and subsoiling operations, and prevents the spread of the root-fungus (*Armillaria mellea*), which, if not treated, soon attacks the roots of the young fruit trees, becomes a menace to them, frequently causing their death in a remarkably short time. This fungus, being saprophytic, is capable of living on the dead roots of the forest timber until those of the young trees are reached.

Plate 5.—Slickers at Work.

The removal of the roots also reduces to a minimum the opportunity of the apple root-borer (*Leptops Hopei*) attacking the roots of the young trees. To eradicate this pest from the orchard area before planting operations commence, no suckers or undergrowths should be allowed to vegetate. They should be dug out and burned rather than ploughed under.

Clearing operations are more easily carried out during winter than at any other time, and when this work is completed in early spring the land should be ploughed and subsoiled, if possible.* The latter operation alters the original formation of the subsoil, assists drainage, which tends to aerate the soil, more moisture is retained during dry weather, thorough cultivation is facilitated, and finally trees planted on soil treated as described thrive better, come into bearing sooner, and produce more uniformly heavy crops of fruit than those cultivated under less congenial conditions.

* Except where the sub-soils are loose and offer free drainage.

Plate 1 shows the work of ploughing and subsoiling in progress. An ordinary single-furrow plough is used, and the sod may be from 8 to 10 inches, according to the depth of the surface soil. The subsoiler follows in the same furrow, breaking up the subsoil to a depth of from 8 to 10 inches, according to requirements. Care should be taken not to bring the subsoil to the surface during this operation.

Plate 2 gives a full view of the subsoiler, showing its construction and the arrangements for regulating the depth at which it may be worked, &c. In charge of a competent operator, this implement has proved highly satisfactory.

When ploughing and subsoiling operations are completed by September, the land should be allowed to remain in the rough until November, when it should be thoroughly worked with a disc cultivator. Plate 3 shows the class of implement used for this kind of work at the Leongatha Labour Colony. After discing the land it should be cross-ploughed and allowed to fallow during the summer.

As soon as weather conditions become favorable in the autumn, the orchard area should be again worked with the cultivator, or harrowed, to prepare it for grading, prior to being brought into a fit state of tilth to receive the young trees.

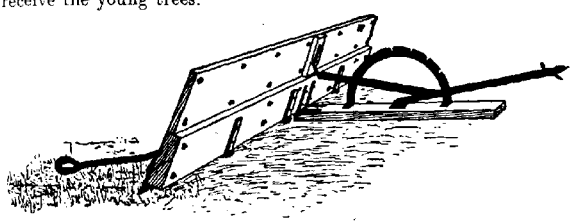

Plate 6.—Buck-scraper.

Grading the Orchard Land.

When an orchard is being established in a northern irrigation district where, as a rule, the land has naturally a fairly even surface, the difficulties met with in grading and making it suitable for irrigation from channels are not so great as those which obtain in the southern and mostly undulating districts, where irrigation from dams is practised.

When serious inequalities in the orchard surface occur, and slightly elevated portions have to be carried away to fill up depressions, the scoop-shaped buck-scraper shown in Plate 4 has been found eminently suitable for the purpose.

Where depressions exist, and there are not sufficient elevations to fill them up, the surface soil could be removed from the headlands, or from situations where dams are to be constructed and used, for this purpose with advantage.

Where slight unevenness exists it may be fined down by the "Slicker," shown in Plate 5. This slicker has been used with satisfaction on the Central Research Farm, Werribee, where it is regarded as one of the most useful implements in grading the land and producing a fine

tilth. The slicker consists of three pieces of oregon 12 inches x 2 inches and 12 feet long, connected by two pieces of 6 inch x 6 inch hardwood, and drawn by four horses. The oregon is shod with 2 inch x ¼ inch steel on the front faces. Two pieces are inclined at an angle of 60 degrees to the horizontal, while the third piece is vertical, and acts as a fulcrum. The operator, by moving forwards or backwards while the implement is moving, can gradually "collect" or "pay out" the soil at will, and so remove inequalities of the surface.

Another design of a buck-scraper is shown in Plate 6, and recommended by Mr. Elwood Mead, when Chairman of the State Rivers and Water Supply Commission. The grading of land for lucerne culture in the Yakima Valley, in Washington, United States of America, is usually done by this implement.

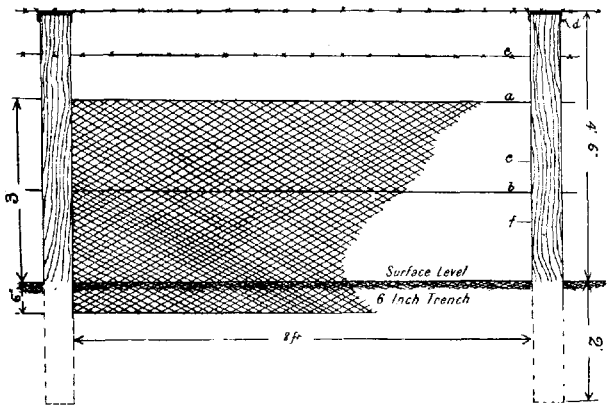

Plate 7.—The Orchard Fence.

Grading operations should be completed in June, so as to permit of the land being ploughed and harrowed before the young trees are planted. As early planting is desirable, this work should be done not later than the end of July, if possible.

FENCING THE ORCHARD.

Rabbits and hares do considerable damage to young trees if permitted to enter the orchard, consequently a substantial rabbit-proof fence should be erected before the trees are planted.

Plate 7 shows the kind of fence recommended. The posts are 6 inches x 6 inches and 4 ft. 6 in. high, with 2 feet in the ground, and 8 feet apart.

Two No. 8 gauge ordinary fencing wires are put in at (a) and (b). These pass through ½-in. holes in the post. The one marked (a) may be threaded through the 1½-in. mesh wire netting, or the netting may be

fastened to it by wire clips. The netting represented by crossed diagonal lines is 3 ft. 6 in. wide, 6 inches of which is trenched in the ground with a turn towards the outside, so that when the rabbits scratch they will come in contact with the netting. Two barbed wires are used (c), drawn through holes in the posts and large enough to permit of passing through freely. The barbed wire on top is stretched along the posts and held in position by a piece of wire, which is passed through the post about 3 inches from the top, a few turns are taken around the barbed wire, as shown at (d). Should two wires be used instead of (b), they may be put in at (e) and (f), and for this purpose No. 10 gauge wire will suffice.

(To be continued.)

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA—*continued.*

(Continued from page 249.)

The White Top Gum (*Eucalyptus vitrea*, R. T. Baker).

(Fig. 48.)

A tall tree with roughish bark similar to that of the Narrow-leaved Peppermint (*E. amygdalina*), the extremities of the branches being smooth. In the adult foliage the leaves are narrow, lance-shaped, about 6 inches long, of dull green, shining on both sides, stalk short, few veins and almost parallel to the midrib. The sucker leaves are alternate or opposite on a short stalk or stalkless, egg-lance-shaped pointed, under 6 inches long, and 1½ inches broad; the lateral veins diverge from below the middle of the midrib, and are prominent on both sides, with the marginal vein removed from the edge of the leaf.

The flower clusters are at the shoulders of leaves, and bear generally from five to eight flowers; buds with lid half-round, short pointed; fruit half-round.

The timber is moderately hard and close grained, full of shakes and gum veins and apparently of little value. This tree is also known as Silvertop Messmate, Peppermint, and Messmate. The term Silvertop refers to the silvery appearance of the tree in the sunlight, due to the reflection of the light from the surface of the shiny leaves causing them to appear silvery. The term White Top is no doubt used to distinguish it from the Peppermint (*E. amygdalina*) often known as Messmate. In Victoria the White Top Gum is found in the eastern parts of the State.

In regard to nectar production nothing distinctive is up to the present known, this tree being like many others known under various local names, and it is therefore inadvisable to allocate what information is available to any one particular species until it is identified on the spot.

Fig. 48.—The White Top Gum (*E. vitrea*, R. T. Baker).

THE GULLY GUM (*Eucalyptus Smithii*, R. T. Baker).

(Fig. 49.)

A ribbony barked tree of considerable size. It has smooth limbs, and most of the butt is smooth. It is closely allied to the Manna Gum (*E. viminalis*), quite identical with the latter in adult as well as *in*

sucker leaves, but while the flower buds of the Manna Gum always occur in threes (or less) the clusters in the case of the Gully Gum usually contain seven flowers, while the rough bark sometimes continues further up the stem than with the Manna Gum, of which it was formerly held to be a variety.

Fig. 49.—The Gully Gum (*E. Smithii*, R. T. Baker).
From R. T. Baker and H. G. Smith, Research on the Eucalypts, &c.

The timber is close grained, hard, and difficult to work. In Victoria the Gully Gum is found in Gippsland gullies.

The information available in regard to the nectar and pollen production of this species cannot at present be isolated from that concerning a number of other trees locally known as White Gums or Ribbon Gums.

The White Brittle Gum (*Eucalyptus maculosa*, R. T. Baker).

(Fig. 50.)

A tree also known as Spotted Gum and Brittle Gum, rarely exceeding 60 feet in height, usually from 20 to 40 feet. The bark is smooth right down to the ground. The sucker leaves are of thin texture, lance or oval lance-shaped, 2 or 3 inches long, opposite or alternate with the

Fig. 50.—The White Brittle Gum (*E. maculosa*, R. T. Baker).
From Proceedings, Linnean Society, N.S.W., 1899

marginal vein removed from the edge of the leaf. The adult leaves are lance-shaped or narrow lance-shaped, curved, not shining and of the same colour on both sides. The veins of the leaves are only faintly marked or rather obscure. Some trees have the leaves quite rigid and erect.

The clusters of from four to sixteen or even twenty flowers are at leaf shoulders, buds stalkless or on very short stalks, top-shaped, lid blunt and of equal length to the lower part of the bud. Fruit half-round to top-shaped with valve flaps projecting in ripe fruit.

The timber is straight grained and easy to work, but seasons badly, and is of little value on account of the presence of Gum veins.

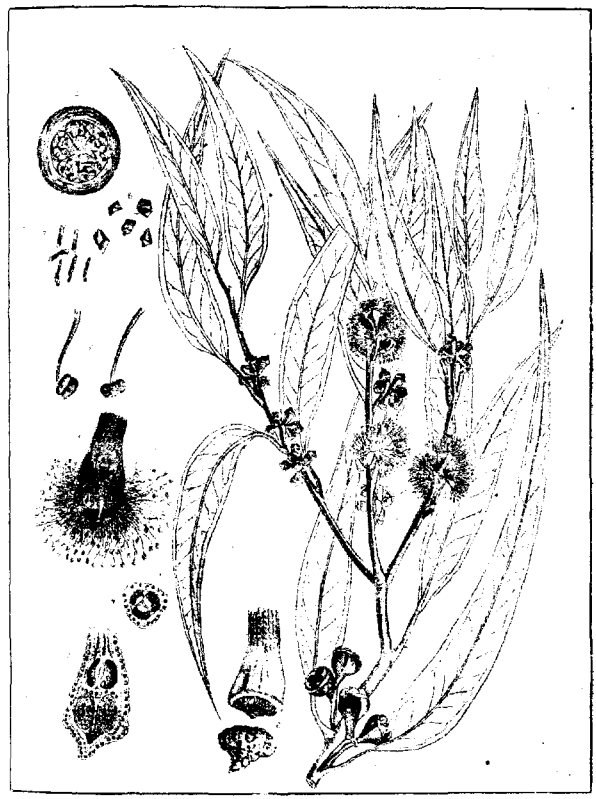

Fig. 51(a).—**The Spotted Blue Gum** (*E. Maideni*, F. von M.) (Adult foliage). From Proceedings, Linnean Society, N.S.W., 1889.

The White Brittle Gum grows in poor, open forest ground to a maximum height of 60 feet with a stem diameter of 1 to 3 feet, and a rather dense head. The bark is different shades of grey or bluish yellow with spots like those of the true Spotted Gum (E. *maculata*).

THE SPOTTED BLUE GUM (*Eucalyptus maideni*, F. v. M.).

(Fig. 51.)

A tree known as Blue Gum and Spotted Gum in different localities, and sometimes erroneously taken for the true Blue Gum (*E. globulus*). It is always a tall, straight-growing tree attaining a height of up to

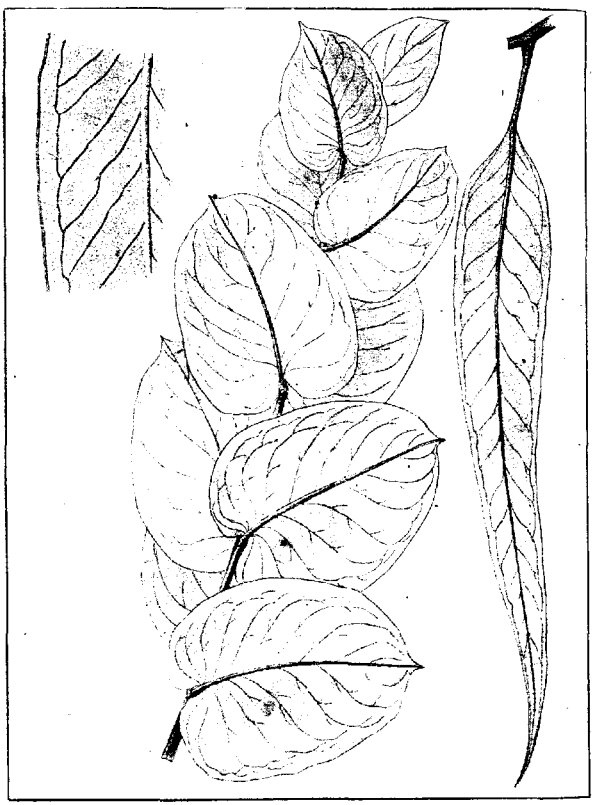

Fig. 51(b).—The Spotted Blue Gum (*E. Maideni*, F. von M.) (Juvenile foliage). From Proceedings, Linnean Society, N.S.W., 1889.

150, or even 200, feet, with a diameter up to 4 feet with a smooth chalky white or bluish bark, hence its local name Blue Gum.

The sucker leaves are very large, frosted or even chalky white, round or heart-shaped, stalkless, and stem clasping on sharply angular branchlets. In changing to the adult foliage the sucker leaves gradually become

alternate and stalked, oblong and lance-shaped, often very narrow lance-shaped and more or less curved, attaining in the mature state a length of 12 inches or more, and resembling much the leaves of the Mountain Gum (*E. goniocalyx*), but not quite so lustrous on the upper side; the veins are distinct, the marginal one removed from the edge.

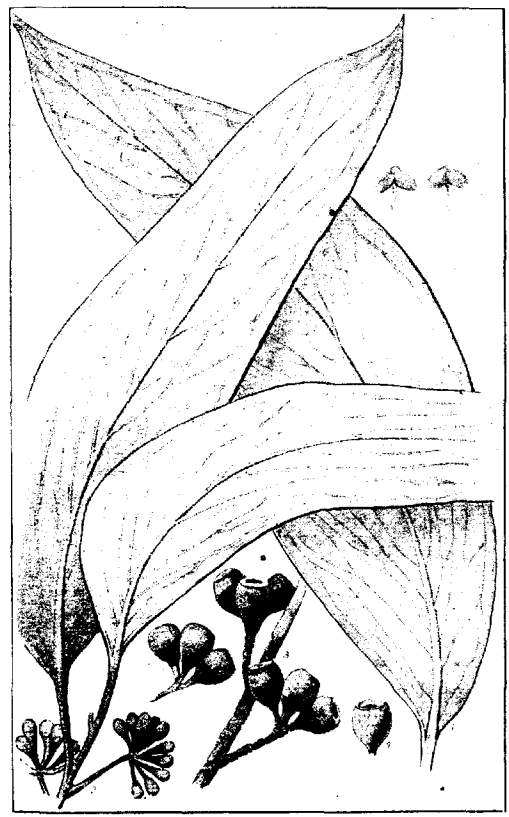

Fig. 52.—The Red Mountain Ash (*E. Delegatensis*, R. T. Baker). From Proceedings, Linnean Society, N.S.W., 1900.

The flowers are few, stalkless, at the shoulders of leaves on a much flattened cluster stalk. The flow cup is angular or flattened, the lid of the bud much constricted and warty.

Fruit, ½ inch in diameter, thus much smaller than that of the real Blue Gum (*E. globulus*) top shaped to somewhat half-round.

The Spotted Blue Gum in general appearance resembles the Blue Gum (*E. globulus*) and the Mountain Gum (*E. goniocalyx*). From the latter, with which it grows in company on the mountain slopes, it is often not readily distinguished, trunks and foliage of the two trees having much the same appearance. They differ, however, in their fruits and sucker leaves, so that there is little difficulty in distinguishing them. They also differ in their timber, while that of the Mountain Gum (*E. goniocalyx*) is of a dirty brown colour that of the Spotted Blue Gum is of a yellow tint. Though not much used, except occasionally for wheelwright's work, it is nevertheless a good durable timber.

No distinct information is yet available as to the value of this species to honey producers and its habits and time of flowering.

THE RED MOUNTAIN ASH (*Eucalyptus Delegatensis*).

(Fig. 52.)

A very tall tree occurring on the top of mountain ranges. The bark is stringy and reddish extending well up the trunk. The leaves are comparatively large, often 9 inches long and 2 broad, pointed lance-shaped, with the veins prominent, the marginal vein removed from the edge. Sucker leaves broad, lance-shaped unevensided with prominent veins.

Flowers six to ten in a cluster on a stalk about 6 inches long at shoulders of leaves; buds with short tube and half-round blunt lid. Fruit pear-shaped with thick rim.

Judged by specimens of leaves and buds this tree is difficult to differentiate from the Silver Top (*E. Sieberiana*), sucker leaves also are very similar, but bark and timber of the two are quite different.

Found in Victoria on mountain ranges in the eastern part.

(*To be continued*).

THE importance of fineness of subdivision to the utility of crusted limestone for soil amendment is shown from the results of experiments conducted at the Pennsylvania Experiment Station, and reported by Walter Thomas and William Frear, in June, 1915.

The crop grown was clover, and separate plots were treated with crusted limestone of various known degrees of fineness. After eight and a half months the crop was harvested, air dried, and weighed.

The figures show (1) the need of the soil for amendment to fit it for clover production; (2) that the fineness of limestone greatly affects its value as an amendment for many months after its application, even to a highly acid soil—the finer the limestone the better the crop, *i.e.*, up to the limits of fineness tested, which was finer that one-hundredth of an inch.

It is given that compact limestone of high purity should be crusted to a fineness of not less than one-sixtieth of an inch, to fit it for economical use as a soil amendment.

THE NEW ALCOHOL TABLES.

From 1st January next the old tables which have been used for many years past in conjunction with Sikes Hydrometer for the determination of alcohol strengths throughout the Empire will be superseded by new tables, known as Thorpe's, recently compiled for and adopted by the Imperial Government.

Though the change will not be of a revolutionary nature, seeing that the maximum divergence between the old tables and the new is in the neighbourhood of 1 per cent. of proof-spirit, it is desirable that wine-makers and all interested in questions of spirit strengths should prepare for the adoption of the new tables, which will come into force on New Year's Day next. Curiously enough, it is at 30 per cent. of proof-spirit, a strength of considerable importance to the wine trade, that the greatest difference between the old and new tables occurs. Thirty per cent. proof marks the dividing line between the 1s. 3d. per gallon and the 3s. per gallon duties for admission of wine into the United Kingdom. The change will mean that a wine now considered to be of a strength of 29.5 per cent. proof, and therefore dutiable at 1s. 3d. per gallon, will, after the 1st January next, according to the new, or Thorpe's Tables, be held to contain 30.5 per cent. of proof-spirit and will have to pay the higher duty of 3s. per gallon. The change will also affect contract sales where it is stipulated that the wine should be of a given alcoholic strength.

The report of the Commonwealth Analyst dealing with the subject, a copy of which has been recently received from the Acting Prime Minister, and which is here reproduced, will no doubt be read with interest by Victorian vine-growers. Several other points are also dealt with: the report recalls, for instance, the old-time controversy concerning the maximum strength of a natural wine, which gave rise to so much discussion in the late seventies of last century.

The investigations as to the strengths of Australian wines shipped to London are also most interesting. The discrepancy between the determinations of alcohol strengths in Melbourne and in London (*see* Table I.) constitute a curious point, and one concerning which further information will be awaited with interest.

FRANÇOIS DE CASTELLA,
Government Viticulturist.

Alcoholic Strength of Australian Wines.

REPORT SUBMITTED BY W. PERCY WILKINSON, COMMONWEALTH ANALYST.

The Comptroller-General of Customs.

The revised tables adopted by the British Government for the calculation of the proof-strength of wines and spirits are legalized by Section 19 of the Finance (No. 2) Act of 1915.

2. The revised tables were compiled in the Government Laboratory, London, under the direction of Sir Edward Thorpe, late Principal of the Government Laboratory, by Mr. T. J. Cheater and Mr. John Holmes

3. During my visit to London in 1912 the Principal of the Government Laboratory, Sir James Dobbie, informed me of the progress made in the computation of the revised alcohol tables, and subsequently Mr. Cheater and Mr. Holmes afforded me detailed information of the procedure followed in the numerous recalculations, carried out with extraordinary accuracy, involved in the preparation of the new tables from the original alcoholometric investigations of Sir Charles Blagden, Gilpin, Drinkwater, and Mendeléeff.

4. The change to the new tables will materially affect the incidence of the wine duty, which is fixed in Great Britain at the limit of 30 per cent. proof-spirit, as the dividing line between the higher and lower rates of duty.

5. The 30 per cent. proof-spirit dividing line between the higher and lower rates of duty was adopted by the British Government on the recommendation contained in the report of the Select Committee of the House of Commons on the wine duties presented to Parliament in 1879. The Committee, in its report, mentioned that the dividing line which then obtained of 26 per cent. proof-spirit between the higher and lower rates of duty on wines had been fixed "to facilitate the consumption of genuine wine, under provisions insuring the necessary safeguard against importation of spirit in the guise of wine, to the detriment of the duty on spirits. With that view, 26 per cent. was fixed as the limit of the alcoholic strength of wines called natural." Evidence was given before the Committee contending that Australian wines were naturally of a higher strength than 26 per cent. proof-spirit. The principal witnesses were Sir H. Blyth, Agent-General for South Australia; Mr. P. B. Burgoyne; Sir H. Barclay, sometime Governor of Cape Colony; and others. Adverse evidence was given by Mr. A. Lalande, President of the Chamber of Commerce, Bordeaux, and by Mr. W. H. Burston, South Australia, in a letter addressed to the Chairman of the Committee.

6. The Select Committee concluded its report by recommending that the standard of strength of wines be raised so as to admit of Australian wines entering at the lower rate.

7. The British Government, acting on the recommendation of the Select Committee of 1879, raised the degree of strength at which wines were admitted at the lower rate from 26 per cent. up to 30 per cent., and it has stood at the latter figure ever since.

8. During the past two years a number of samples, representative of bulk shipments of Australian wine to London, have been tested in the Commonwealth Laboratory. The samples are averages, and representative of shipments comprising at least 1,475 hhds. and quarter-casks, the contents of which were approximately 69,000 gallons. The same casks from which the samples were drawn in Australia prior to shipment were also sampled by the Officers of Customs and Excise after arrival at the London docks, and tested in the Government Laboratory, London, under arrangement agreed to by the Board of Customs and Excise.

9 The tests of these Australian wine imports conducted in the Government Laboratory, London, are, in general, in good agreement with the tests of samples drawn from the same casks in Australia prior to shipment. (*See* Table I., appended hereto.) The differences observed are, in the majority of instances, lower readings for strength to the extent of about 0.5 per cent. In five cases only has an increase in strength been recorded in London; in four of these the difference falls

within the limit of experimental error. The remaining instance showed a gain in strength of 1.2 per cent. proof-spirit. This, however, has not been due to secondary fermentation during the voyage to London, as the wine, prior to shipment, was proved to contain no fermentable sugar.

10. In Table II., appended, details are tabulated of the tests made in the Commonwealth Laboratory of these shipments of Australian wine, and the strength, as ascertained by Hehner's tables, and also by the new tables, are recorded for comparison. It will be observed that the strength of the bulk shipments of wines exported during the past two years, when calculated by the new tables, ranges from a minimum of 23.3 per cent. up to a maximum of 28.7 per cent. By the Hehner tables, the strength found was uniformly 0.5 per cent. higher. It is generally known, however, that Hehner's tables give higher values than the official Sikes tables to the extent of about 1 per cent. This was commented upon by Sir James Dobbie.

11. It is desirable that the fact should be emphasized strongly that the bulk exports of Australian wines represent blends on a very large scale of wines of similar character and type, though often of different vintages. The alcoholic strength of the wines entering into a blend is therefore normally subject to some variation, the strength of the blend being proportionate to those of the wines entering into the blend.

12. It has not yet been proved that the earlier statements as to the alcoholic strength of Australian wines, though exceptionally only, rising to as much as 30 per cent. of proof-spirit, or even exceeding that figure, are not correct. Investigations into this matter have been in progress in the Commonwealth Laboratory for some time, and are not yet completed.

13. The incidence of the British new tables for ascertaining the strength of spirits and wines becomes, therefore, a matter of importance to the Australian wine industry. In Table III., appended hereto, the special incidence of the new tables, as compared with the Sikes tables, is shown for the degrees Sikes ranging from 89.0 degrees to 92.0 degrees: it is at the higher degrees of Sikes, viz., those in the neighbourhood of 30 per cent. proof-spirit, that the naturally strong Australian wines may occasionally be at a disadvantage on importation to Great Britain, for the alcoholic strength by the old tables of a wine formerly permitted importation under the lower rate of duty at 29.5 per cent. proof-spirit would, under the new tables, be assessed at 30.5 per cent. proof-spirit at the higher rate of duty.

14. Bearing in mind that the samples representing bulk wine exported to London, tested in the Commonwealth Laboratory during the past two years, have been blends of wines varying to some extent in their natural alcoholic strength, it must be conceded that there is a possibility, when unblended Australian wines of the maximum strength are exported to Great Britain, that they may be charged at the higher rate of duty, for the new tables, in the critical neighbourhood of 29 to 30 per cent. proof-spirit, read approximately 1 per cent. higher than the old official tables.

15. In view of the above facts, and also as a means of providing against the common sources of experimental error in the sampling of bulk wines and in the analytical testing for alcoholic strength, it is recommended that representations be made to the Under-Secretary of

TABLE I.

Exporter.	Cask Mark.	Shipped by.	Consigned to.	Melbourne Date of Test.	Alcoholic Strength.		
					Com. Lab.	Govt. Lab., London.	Difference.
E. Collins	2	s.s. *Commonwealth*	W. and A. Gilbey ..	23.7.1914	25·2%	25·2%	0·0%
P. B. Burgoyne and Co., 6,106 g. ..	212 } 100 hhds. ..	s.s. *Marathon* ..	P. B. Burgoyne Ltd.	21.7.1914	26·4%	26·2%	− 0·2%
	287 }	„	„ „	„	26·6%	26·2%	− 0·4%
P. B. Burgoyne and Co., 6,637 g. ..	2205 } 200 qr. casks ..	s.s. *Commonwealth*	„ „	29.7.1914	25·8%	25·1%	− 0·7%
	2321 }	„	„ „	„	25·4%	25·1%	− 0·3%
P. B. Burgoyne and Co., 6,686 g. ..	1999 } 200 qr. casks ..	s.s. *Ballarat* ..	„ „	20.6.1914	25·3%	25·1%	− 0·2%
	2145 }	„ ..	„ „	„	25·8%	25·4%	− 0·4%
P. B. Burgoyne and Co., 6,448 g. ..	2584 } 100 hhds. ..	s.s. *Persic* ..	„ „	25.5.1915	29·2%	27·0%	− 2·2%
	2644 }	„ ..	„ „	„	29·0%	27·1%	− 1·9%
P. B. Burgoyne and Co., 10,268 g. ..	3005 } 160 hhds. ..	s.s. *Poona* ..	„ „	3.8.1915	26·3%	26·6%	+ 0·3%
	3051 }	„ ..	„ „	„	25·8%	26·3%	+ 0·5%
P. B. Burgoyne and Co., 3,440 g. ..	3208 } 100 qr. casks ..	„ ..	„ „	„	27·7%	27·3%	− 0·4%
P. B. Burgoyne and Co., 12,509 g. ..	3431 } 200 hhds. ..	s.s. *Malakuta* ..	„ „	18.9.1915	28·7%	28·6%	− 0·1%
P. B. Burgoyne and Co., 4,007 g. ..	3635 } 120 qr. casks ..	„ ..	„ „	„	26·1%	25·6%	− 0·5%
P. B. Burgoyne and Co., 3,235 g. ..	3230 } 50 hhds. ..	s.s. *Cooee* ..	„ „	12.8.1915	27·7%	28·1%	+ 0·4%
3,342 g. ..	3340 } 100 qr. casks ..	„ ..	„ „	„	26·3%	27·5%	+ 1·2%
P. B. Burgoyne and Co. 3,399 g. ..	3870 } 100 qr. casks ..	„ ..	„ „	„	25·1%	25·2%	+ 0·1%
	3936 }	„ ..	„ „	„	25·6%	25·3%	− 0·3%
P. B. Burgoyne and Co. 2,818 g. ..	3960 } 45 hhds. ..	s.s. *Khyber* ..	„ „	21.10.1915	23·8%	23·1%	− 0·7%
	3990 }	„ ..	„ „	„	23·8%	24·5%	+ 0·7%

TABLE II.

Cask No.	Com. Lab. Test, calculated by Hehner's Tables.	Com. Lab. Test, calculated by Thorpe's Tables.	Reduction by New Tables.
2	25·2%	24·8%	— 0.4%
212	26·4%	25·9%	— 0·5%
287	26·6%	26·1%	— 0·5%
2205	25·8%	25·3%	— 0·5%
2321	25·4%	24·9%	— 0·5%
1999	25·3%	24·8%	— 0·5%
2145	25·8%	25·3%	— 0·5%
2584	29·2%	28·7%	— 0·5%
2644	29·0%	28·5%	— 0·5%
3005	26·3%	25·8%	— 0·5%
3051	25·8%	25·3%	— 0·5%
3208	27·7%	27·2%	— 0·5%
3431	28·7%	28·2%	— 0·5%
3635	26·1%	25·6%	— 0·5%
3230	27·7%	27·2%	— 0·5%
3340	26·3%	25·8%	— 0·5%
3870	25·1%	24·7%	— 0·4%
3936	25·6%	25·1%	— 0·5%
3960	23·8%	23·3%	— 0·5%
3990	23·8%	23·3%	— 0·5%

TABLE III.

TABLE SHOWING INCIDENCE ON WINE DUTIES OF THORPE'S NEW TABLES ON ALCOHOL.

Sikes.	Old Tables.	Proof-spirit Percentage.	New Tables.	Proof-spirit Percentage.	Increase in Percentage Proof-spirit, due to New Tables.
	Under-proof.				
%	%	%	%	%	%
89·0	69·4	30·6	68·4	31·6	+ 1·0
89·2	70·1	29·9	69·1	30·9	+ 1·0
89·4	70·8	29·2	69·8	30·2	+ 1·0
89·6	71·4	28·6	70·5	29·5	+ 0·9
89·8	72·1	27·9	71·2	28·8	+ 0·9
90·0	72·8	27·2	71·9	28·1	+ 0·9
90·2	73·5	26·5	72·5	27·5	+ 1·0
90·4	74·1	25.9	73·1	26·9	+ 1·0
90·6	74·8	25·2	73·8	26·2	+ 1·0
90·8	75·4	24·6	74·5	25·5	+ 0·9
91·0	76·1	23·9	75·2	24·8	+ 0·9
92·0	79·2	20·8	78·4	21·6	+ 0·8

State, Colonial Office, to move the Commissioners of Customs and Excise, with the object of securing, in the administrative practice of their Department, a working tolerance or margin of safety of 0.5 per cent. on the limiting strength of 30 per cent. in favour of all wines imported in cask, and known to the trade as "dry" wines. These completely fermented and natural "dry" wines are the only types of bulk wines exported from Australia to the Mother Country.*

16. As this matter is one of great importance to the Governments of the States of New South Wales, Victoria, South Australia, and Western Australia, it is recommended that a copy of this report should be furnished to those Governments.

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* Whilst the above was in press the Acting Prime Minister was advised by the High Commissioner that the Lords Commissioners of the British Treasury are unable to agree to this suggestion, for the reason that it would not be practicable to give special treatment to Australian wines in the matter. They point out that the postponement of the operation of the new tables, as regards wines, until 1st January, 1917, should enable any necessary alteration in the strength of the wine to be made before importation into the United Kingdom.

INCREASING THE MILK YIELD.

The *Farmer and Stockbreeder* says:—"At the present time there is a strong demand that farmers should do their utmost to increase the production of food. It is interesting, therefore, to see what can be done in the way of producing more milk and butter. The first point we should remember in this connexion is, that the greater the milk yield of our cows, the cheaper will the milk be produced per gallon. We can do very little by feeding. If we have a splendid cow we can feed her so that she will do her best; if we have a poor cow we can do the same. But no amount of food will make a poor cow give a good yield. If we try to force her she may give a little more milk, but the extra milk will probably not pay for the extra food required. We might be able to increase the number of cows giving milk, and each must think that out for himself. The recognised way of increasing the milk yield of a herd is by selective breeding, but that is a process which requires years of careful attention to achieve a measurable improvement. By employing bulls of a good milking strain and mating them with selected cows which have given good yields of milk, something can be done. The importance of weighing the milk from each cow and regularly recording it should be recognized. It is in times of stress usually that the greatest progress is made. The progress made in Sweden by the work of the milk recording societies is shown in the following calculated annual yields per cow:—1870, 2,600 lbs.; 1880, 3,700 lbs.; 1903, 4,200 lbs.; 1913, 4,730 lbs. The champion American Holstein-Friesian cow, Tilly Alcatra, gave 30,451 lbs. of milk, so there is plenty of room for improvement in the average cow still."

RICE CULTIVATION, KOYUGA.

By Temple A. J. Smith, Chief Field Officer.

Mr. Montague Shan, who resides on an area 3 miles from the Koyuga railway station, has lately been experimenting with rice cultivation. The land on which the rice is growing is partly red land and partly low-lying black land, and was cultivated before sowing much as wheat land is prepared. The land was watered before seeding, and the seed drilled in in rows 14 inches apart at a depth of 1 inch, the quantity of seed sown being 30 lbs. per acre. The date of sowing the 26th November, 1915—the variety being that known as "Takasuka."

Water was applied once a week from the time of seeding until a week before harvesting, which operation was in progress at the time of my visit (1st June). Superphosphate at the rate of 120 lbs. per acre was applied.

The crop, when ripe, was 2 ft. 6 in. in height, and very uniform, but had ripened unevenly, some of the heads and stalks being green, while others appeared fully matured. Patches of the crop had not filled well, which will have a bad effect on the yield as a whole.

The stooling capacity of rice is very great, from 30 to 40 stalks growing from one seed. No sign of disease was noticeable in the crop. A portion had been harvested with a stripper-harvester, yielding at the rate of seven bags per acre of rice with the hull on, which, when hulled, would leave 60 per cent. of marketable rice, viz., 756 lbs. per acre.

This system of harvesting was wasteful, in that the harvester was not a suitable machine for the purpose, leaving some of the rice on the stalks, and shelling a portion on the ground. The straw also was left on the ground, and as this is useful for stock-feeding, thatching, &c., such a system of harvesting is not desirable.

Mr. Shan has had constructed a special dam which is filled from the channels, and in which applications of water can be made when water is not available from the usual sources. This is highly necessary, as the land on which the rice is growing must not be allowed to dry out, but must be kept moist at all times. The amount of water per acre used in this experiment was 5 acre-feet, and Mr. Shan makes the suggestion that rice could be grown in seasons when water is plentiful, and fodder crops in dry years when they have a higher market value. He is of opinion that rice-growing would utilize low-lying land that at present is too wet for the successful cropping of wheat and other cereals. There is a considerable area of such land along the Murray River and in various other parts of the State.

Mr. Shan gives the following estimate of the cost of growing rice:—

	£	s.	d.
Rent of land	0	10	0
Interest on cost of grading	0	10	0
Water charges	1	5	0
Seed and labour	1	15	0
Cultivation, manures, harvesting, &c.	1	10	0
	£5	10	0

756 lbs. at 2d. per lb. would return £6 6s. per acre—leaving a balance of 16s. per acre. The average return from rice is approximately

1,600 lbs., which, at the wholesale price of 2d., would give £13 6s. 8d. per acre.

As might be anticipated, Mr. Shan's first experiment has shown that very material improvement in methods of cultivation can be made. The crop in the first place was much too thick, and instead of sowing 30 lbs. per acre, 20 lbs. would probably be quite sufficient, and lead to better filled heads. Cutting the crop with a reaper and binder and threshing later is the practice adopted on the rice fields of America, and this would probably be advisable here.

It is unlikely that the most suitable variety has been found, at the first attempt, to give the best possible results, and further improvement is probable in the direction of the introduction of a rice seed yielding better than that already grown.

Earlier seeding, say about the middle of October, would give the crop a better opportunity of maturing grain to advantage.

Mr. Shan is to be congratulated upon the success of his first venture in rice-growing. He has proved that the crop can be grown under local conditions on land that for other purposes is of little value. He is so satisfied with the prospect that he intends sowing 60 acres in the coming season. Other farmers in the district are sowing small areas, and are obtaining the seed from Mr. Shan at 1s. per lb.

The main essentials for success in rice-growing appear to be a soil capable of holding moisture beyond the average.

Perfect grading at an almost dead level.

A thorough command of water as required.

The right kind of machinery for handling the crop.

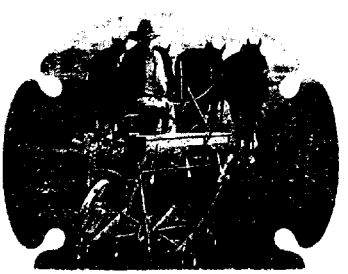
The use of specially suited varieties.

The land should be fallowed in autumn, and a good seed-bed prepared in the spring.

The soil should never be allowed to dry out after the seed is planted, until harvest time.

A good system of drainage so that the water can be taken off when required.

The crop, after harvesting, should be well dried out before threshing, to save cracking the grain.



INSECT PESTS OF THE FRUIT, FLOWER, AND VEGETABLE GARDEN.

AND HOW TO TREAT THEM.

By C. French, Jnr., Government Entomologist.

(Continued from page 438.)

The Dark-Purple Wattle Scale.

(Mealy Bug.)

Unfortunately, growers of wattles have another native pest to contend with, namely, the dark-purple wattle scale (mealy bug). This formidable insect was first discovered on the so-called cape wattle, but it now attacks all kinds of wattles planted in gardens and plantations. In general appearance it is black and white, but upon closer examination it may be seen that it is of a dark-plum colour, almost black, with a white margin, the female being covered with a cottony secretion. The larvæ are singular-looking insects; at certain seasons of the year they simply swam over the affected trees, and from thence are easily distributed by means of plants, and possibly, by birds carrying them on their feet from tree to tree. When a tree is badly affected, the branches become black and dirty looking, and if the pests are left unchecked they will soon kill the tree right out. This pest is now spreading to orange trees, so growers should be on the lookout, as it is certainly a most destructive species. Many remedies have been tried, and good results have been obtained by using the kerosene emulsion on large trees, and the red oil in places where there are only one or two small trees.

Fig. 16.—The Dark-Purple Wattle Scale (*Pseudococcus albizziæ*, Maskell).

Spraying with the red oil should be done in summer or autumn. Several brands of this oil are on the market, the price of same being within the reach of all.

Whilst on the topic of mealy bugs, I might be permitted to mention a pest very destructive to carnation plants, viz., the common mealy bug. This insect is often very prevalent, and causes growers much concern by living on the roots of carnations. Recent experiments with the manurial insecticide and fumus have given excellent results. These preparations are sprinkled on the soil and then dug into the ground. They are deadly to all kinds of insect life, &c., such as millipedes, wire-worms, slaters.

The Bean Butterfly.

This is a very common, small, blue butterfly, the larva of which causes growers of French and broad beans much annoyance. The eggs of the butterfly are deposited on the beans, and as soon as the young caterpillars are hatched they commence at once to bore into the pods, and soon eat the young beans; the pods then become yellow, and shrivel up. The larva of this insect is greenish, and in shape is not unlike the woodlouse (Slater). During the last couple of months, these butterflies have been very numerous in vegetable gardens in the suburbs, and growers of beans have had to wage continual warfare against them. Immediately the beans show signs of shape, and if the butterfly season be at hand, spray the rows with arsenate of lead, this preparation, on account of its weak strength, being particularly harmless to human beings. These insects have many natural enemies, especially amongst our insectivorous birds, such as "fly-catchers," robins, wrens, tomtits, &c., all of which destroy vast numbers of the perfect insects annually.

Fig. 17.—The Bean Butterfly
(*Zizera labradus*, Godt).

The Pumpkin Beetle.

This is a handsome little insect, about ¼ inch long by ⅛ inch broad, not unlike some of the ladybird beetles. In colour it is a distinct orange-yellow, with a blackish patch in the shoulder of each wing-case, with

a corresponding but more rounded blackish spot towards the tips of the wing-cases. The eggs, which are placed on leaves, stems, &c., are irregularly oval in form, and finely granulated with an irregular network pattern. Although they are only about as big as a pin's head, they are still easily seen with the naked eye. They take about a week

Fig. 18.—The Pumpkin Beetle (*Aulacophora hilaris*, Bois).

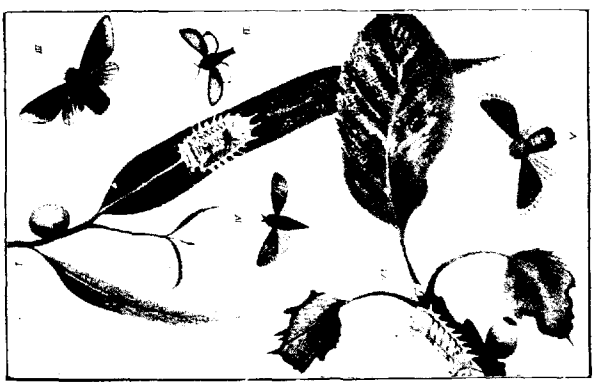


Fig. 19.—Mottled Cup Moths (*Doratifera vulnerans*, Lewin).

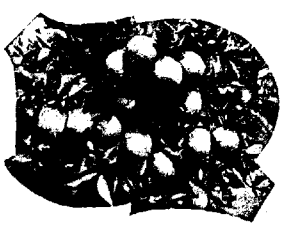
to hatch out. As a rule, the depredations of this beetle have mostly been confined to plants belonging to the melon, pumpkin, and marrow family; but, unfortunately, it has also started to attack peaches, nectarines, cherries, young apples, &c., and in some districts causes considerable losses. The following sprays have been tried with splendid

results:—Arsenate of lead, hellebore, Paris green, and kerosene emulsion. Another remedy has been tried with good results, viz., 1 part of kerosene oil, 1 part of sour milk, and 100 parts of water. The crude oil of tar, which is used generally for veterinary purposes, and costs about 2s. per gallon, can be used. One gallon makes 80 gallons of spray. When the pumpkin beetles were very plentiful in 1913, this spray was used with good results. Dusting the plants with air-slaked lime has also proved effectual.

Mottled Cup Moths.

The common name of the cup moth has been adopted on account of the singular woody and cup-shaped cocoon of the insect. The larvæ of this moth are peculiar creatures, being flat and soft on the under side, and raised saddle-like on the upper side, the upper part being covered with clusters of spines. These spines can be withdrawn at the pleasure of the insect, and when handled by the incautious they produce a sharp stinging sensation, and on this account the larvæ have earned for themselves the name of "stingers." This insect is usually found feeding on the leaves of the eucalypts, and at the present time are exceedingly numerous in and near the Dandenong and other Ranges, on the leaves of the peppermint and other eucalypts. The larvæ eat the epidermis from the leaves, and in some localities many trees look as if a fire had scorched them. Like many of the other native insects, it has taken to fruit trees, principally apples and cherries. They are voracious feeders, and sometimes nine or ten larvæ are found upon one leaf. The caterpillars of this moth have a very persistent enemy in one of the large Ichneumon wasps, which deposits its eggs on the grub before it begins to spin its cocoon; and when the wasp is fully grown it gnaws a circular hole through the side of this prison, as, unlike the moth, it is unable to push the lid off. Arsenical sprays, Paris green, or arsenate of lead will deal effectively with this pest when on fruit trees. The caterpillars of this moth were killed in great numbers a year or so ago near Melbourne by means of a bacterial disease. Owing to their spines, the caterpillars of the cup moths are left severely alone by insect-eating birds.

(To be continued.)



VEGETABLE PAINT.

In certain parts of Uruguay, the farm buildings are a fine white colour, even during the wet season. To obtain this neat effect, a white-wash is used, made from the sliced "leaves" of the Prickly Pear, which when macerated in water for twenty-four hours, produce a solution of creamy consistence. To this lime is added and well mixed in. When the solution is applied to any surface, be it wood, brick, iron, or other material, a beautiful pearly white appearance is produced, which endures through rains and frosts for many years.—The *Tropical Agriculturist*, February, 1916.

VERNACULAR NAMES OF VICTORIAN PLANTS.

Communicated by Alfred J. Ewart, D.Sc. Ph.D., Chairman, and C. S. Sutton, M.B. Ch.B., Secretary of the Plant Names Committee of the Field Naturalists' Club of Victoria.

Continued from page 243, Vol. xiv. (10th April, 1916).

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ HYPOGYNÆ—*continued.*		
LABIATÆ.		
Plectranthus—		
*parviflorus, Henckel. ..	Cockspur flower	Especially worthy of garden culture.
Mentha—		
laxiflora, Benth. ..	Forest Mint	May possibly afford a source of oil or perfume, or be of use as culinary herbs.
australis, R.Br.	River Mint	
gracilis, R.Br.	Slender Mint	
saturejoides, R.Br. ..	Creeping Mint	
Lycopus—		
europæus, L. (L. australis, R.Br.)	Gipsywort	Yields a black dye, used by gypsies.
Salvia—		
plebeja, R.Br.	Austral Sage	Of no known economic value.
Prunella—		
vulgaris, A.DC.	Selfheal	Formerly used as a medicinal herb.
Scutellaria—		
mollis, R.Br.	Soft Skullcap	Of no known economic value.
humilis, R.Br.	Dwarf Skullcap	
Prostanthera—		
lasianthos, Labill. ..	Christmas Bush ..	All the species of this genus are more or less worthy of garden culture, and more especially P. melissifolia, P. lasianthos, P. rotundifolia, P. denticulata, or the red-flowered P. microphylla, and P. aspalathoides.
melissifolia, F.v.M. ..	Balm Mint Bush ..	
incisa, R.Br.	Cut-leaved Mint Bush ..	
rotundifolia, R.Br. ..	Round-leaved Mint Bush	
violacea, R.Br.	Violet Mint Bush ..	
hirtula, F.v.M.	Hairy Mint Bush ..	
denticulata, R.Br. ..	Rough Mint Bush ..	
spinosa, F.v.M.	Spiny Mint Bush ..	
cuneata, Benth. ..	Alpine Mint Bush ..	
phylicifolia, F.v.M. ..	Spiked Mint Bush ..	
decussata, F.v.M. ..	Dense Mint Bush ..	
Behriana, Schlech. ..	Grey Mint Bush ..	
nivea, Cunn.	Snowy Mint Bush ..	
saxicola, R.Br.	Rock Mint Bush ..	
debilis, F.v.M.	Slender Mint Bush ..	
Walteri, F.v.M. ..	Mountain Mint Bush ..	
microphylla, A. Cunn. ..	Small-leaved Mint Bush ..	
aspalathoides, A. Cunn. ..	Scarlet Mint Bush ..	
chlorantha, F.v.M. ..	Green Mint Bush ..	

*Plants marked thus are listed either as growing plants or as seeds by one or more of our florists.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
SYMPETALEÆ HYPOGYNÆ—*continued.*		
LABIATÆ—*continued.*		
Westringia—		
rosmariniformis, Smith	Rosemary Westringia	Most of the species of this genus are worthy of garden culture, and more particularly W. rosmariniformis and W. glabra.
rigida, R.Br.	Stiff Westringia	
senifolia, F.v.M.	Alpine Westringia	
eremicola, A. Cunn.	Slender Westringia	
glabra R.Br.	Violet Westringia	
Ajuga—		
australis, R.Br.	Bugle	Worthy of garden culture, but apt to become a weed in moist pastures.
Teucrium—		
sessiliflorum, Bth.	Scented Germander	Might be improved by garden cultivation.
corymbosum, R.Br	Forest Germander	
racemosum, R.Br.	Grey Germander	
VERBENACEÆ.		
Verbena—		
officinalis, L.	Common Verwin	Formerly used as a medicinal herb.
Chloanthes—		
parviflora, Walpers.	Small-flowered Chloanthes	No known economic value.
Avicennia—		
officinalis, L.	White Mangrove	Useful as a fixing agent on marine mud flats ant inlets.
MYOPORACEÆ.		
Eremophila—		
oppositifolia, R.Br.	Twin-leaved Emubush	The bruised leaves of this plant are used by the aborigines for tanning wallaby and other skins.
longifolia, F.v.M.	Berrigan	Of the Eremophilas, the following are especially worthy of garden cultivation, E. bignoniflora, E. maculata, E. gibbosifolia, E. divaricuta; but E. maculata is a supposed poison plant, and appears to be most dangerous when in fruit.
polyclada, F.v.M.	Branching Emubush	
bignoniflora, F.v.M.	Bignonia Emubush	
Brownii, F.v.M.	Dwarf Emubush	
maculata, F.v.M.	Spotted Emubush	
alternifolia, R.Br.	Tufted Emubush	
scorparia, F.v.M.	Silvery Emubush	
gibbosifolia, F.v.M.	Scaly Emubush	
divaricata, F.v.M.	Spreading Emubush	
Myoporum—		
tenuifolium, G. Forst.	Thin-leaved Myoporum	Not injurious, but of no special economic value.
Dampieri, Cunn.	Waterbush	
deserti, Cunn.	Turkeybush	Suspected as a poison plant when in fruit.
insulare, R.Br.	Coast Boobialla	Useful for hedges and wind-breaks in coastal districts.
viscosum, R.Br.	Sticky Boobialla	Of no special economic value.
humile, R.Br.	Creeping Myoporum	Useful in rockeries and on the sides of railway cuttings, &c.
platycarpum, R.Br.	Sugar Wood	This wood has a fine grain, is beautifully mottled, and is suitable for veneering &c.
floribundum, Cunn.	Many-flowered Myoporum	Useful for garden cultivation.
BORAGINACEÆ.		
Cynoglossum—		
latifolium, R.Br.	Broad-leaved Hounds-tongue	No special economic value, and apt to become weeds in pastures, while the nutlets adhere to wool.
suaveolens, R.Br.	Sweet Houndstougue	
australe, R.Br.	Austral Houndstongue	
Rochelia—		
Maccoya, F.v.M.	White Rochelia	
Lappula—		
concava, F.v.M.	Burr Forget-me-not	
Eritrichum—		
australasicum, A.DC.	Hairy Eritrichum	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
Sympetalæ Hypogynæ—*continued.*		
Boraginaceæ—*continued.*		
Myosotis—		
australis, R.Br.	Austral Forget-me-not ..	Useful in garden cultivation.
suaveolens, Par. (M. exarrhenal)	Sweet Forget-me-not ..	
Halgania—		
cyanea, Lindl.	Small-leaved Halgania ..	Have bright blue flowers, and might prove worthy of garden cultivation.
lavandulacea, Lindl. ..	Lavender Halgania ..	
Heliotropium—		
Curassavicum, L. ..	Smooth Heliotrope ..	These plants are apt to become troublesome weeds in crops and pastures.
europæum, L.	Common Heliotrope ..	
asperrimum, R.Br. ..	Rough Heliotrope ..	
Rhetia—		
acuminata, R.Br. ..	Brown Cedarwood ..	The wood is useful for cabinet work.
Ericaceæ.		
Cauliera—		
hispida, R.Br.	Waxcluster	The fruits are edible, the flavour is not unpleasant.
Wittsteinia—		
vaccinacea, F.v.M. ..	Baw Baw Berry ..	Worthy of garden culture.
Epacridaceæ.		
Styphelia—		
adscendens, R.Br. ..	Golden Heath	The fruits are edible.
Astroloma—		
humifusum, R.Br. ..	Cranberry Heath ..	The fruits are edible. They have a viscid sweetish pulp with a relatively large stone.
conostephioides, F.v.M. ..	Flame Heath	Worthy of garden cultivation.
pinifolium, Benth. ..	Pine Heath	
Melichrus—		
urceolatus, R.Br. ..	Pitcher Heath	
Cyathodes—		
accrosa, R. Br.	Dagger Heath	
Lissanthe—		
strigosa, R.Br.	Peach Heath	
montana, R.Br. ..	Mountain Peach Heath ..	
Leucopogon—		
lanceolatus, R.Br. ..	Lance Beard Heath ..	All more or less worthy of garden cultivation, especially L. Richei, L. ericoides, L. glacialis, and L. virgatus.
Richei, R.Br.	Coast Beard Heath ..	
australis, R.Br.	Spike Beard Heath ..	
thymifolius, Lindl. ..	Thyme Beard Heath ..	
collinus, R.Br.	Rough Beard Heath ..	
glacialis, Lindl. ..	Twisted Beard Heath ..	
microphyllus, R.Br. ..	Scaly Beard Heath ..	
costatus, F.v.M. ..	Twiggy Beard Heath ..	
virgatus, R.Br.	Snow Beard Heath ..	
Hookeri, Sond.	Mountain Beard Heath ..	
Macraei, F.v.M. ..	Alpine Beard Heath ..	
attenuatus, A. Cunn. ..	Grey Beard Heath ..	
ericoides, R. Br. ..	Pink Beard Heath ..	
cordifolius, Lindl. ..	Heart-leaved Beard Heath	
biflorus, R.Br.	Twin-leaved Beard Heath	
Fraseri, A. Cunn. ..	Slender Beard Heath ..	
juniperinus, R.Br. ..	Prickly Beard Heath ..	
rufus, Lindl.	Ruddy Beard Heath ..	
Woodsii, F.v.M.	Broom Beard Heath ..	
Acrotriche—		
serrulata, Labill. ..	Green Ground Berry ..	The flowers yield honey, but the plants have no other special economic value.
var. ventricosa	Trailing Ground Berry ..	
ovalifolia, R.Br.	Coast Ground Berry ..	
depressa, R.Br.	Wiry Ground Berry ..	
Monotoca—		
elliptica, R.Br.	Tree Broom Heath ..	
scoparia, R.Br.	Prickly Broom Heath ..	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
SYMPETALÆ HYPOGYNÆ—*continued.*		
EPACRIDACEÆ—*continued.*		
***Brachyloma*—**		
daphnoides, Benth.	Daphne Heath	Eaten by wallabies in time of drought but of no special economic value.
ciliatum, Benth.	Fringe Heath	
depressum, Benth.	Spreading Heath	
ericoides, Sonder.	Bush Heath	
***Trochocarpa*—**		
Clarkei, F.v.M.	Wheel Heath	Of no known economic value.
***Pentachondra*—**		
pumila, R.Br.	Dwarf Heath	
***Epacris*—**		
longiflora, Cav.	Fuchsia Heath	All more or less worthy of garden culture, especially E. impressa, E. longiflora, and E. microphylla.
impressa, Labill.	Common Heath	
petrophila, Hook. f.	Rock Heath	
crassifolia, R.Br.	Thin-leaved Heath	
robusta, Benth.	Round Heath	
obtusifolia, Smith	Blunt-leaved Heath	
lanuginosa, Labill.	Woolly Heath	
paludosa, R.Br.	Swamp Heath	
breviflora, Stapf.	Short-flowered Heath	
bawbawiensis, Stapf.	Baw Baw Heath	
serpillifolia, R.Br.	Thyme Heath	
microphylla, R.Br.	Coral Heath	
***Sprengelia*—**		
incarnata, Smith	Pink Swamp Heath	Worthy of garden culture, especially in moist situations.
***Richea*—**		
Gunnii, Hook. f.	Richea	Of no known economic value.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Conducted at the School of Horticulture, Burnley.

MONTHLY REPORT (15TH JUNE TO 15TH JULY, 1916).

The average temperature for the past month has been low. This fact, in addition to the light rains which have fallen, has kept the yards wet and cold, and has been against heavy laying among the light breeds.

The heavy breeds right through are doing well, and demonstrating their great value as winter layers. The light breeds dry mash section are also giving good returns. Taken altogether, the output is as good as could be expected. Twelve of the heavy breeds and one Leghorn have been broody during the month.

Temperature: Lowest, 32 deg. Fahr.; highest, 60 deg. Rainfall, 162 points.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-17.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.6.16	15.6.16 to 15.7.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
7	C. J. Jackson	White Leghorns ..	245	122	367	1
25	A. H. Mould	,, ..	237	119	356	2
40	A. Brundrett	,, ..	247	106	353	3
13	H. J. Meddows	,, ..	240	107	347	4
1	G. McDonnell	,, ..	229	115	344	5
26	E. W. Hippe	,, ..	240	103	343	6
27	John Blacker	,, ..	250	93	343	
17	W. G. Swift	,, ..	255	83	338	8
37	J. M. Smith	,, ..	219	111	330	9
41	Excelsior Poultry Farm ..	,, ..	237	90	327	10
24	H. N. H. Miramis ..	,, (5 birds)	205	118	323	11
38	V. Little	White Leghorns ..	232	90	322	12
28	S. Cheatle	R.C.B. Leghorns ..	212	110	322	
10	J. H. Duncan	White Leghorns ..	187	130	317	14
22	Mrs. H. Stevenson ..	,, ..	198	119	317	
44	J. Jamieson	,, ..	204	101	305	16
23	T. A. Pettigrove ..	,, ..	202	95	297	17
15	G. Laughlan	,, ..	204	85	289	18
16	F. Collings	,, ..	230	56	286	19
34	F. G. Silbereisen ..	,, ..	210	75	285	20
14	W. R. Hustler	,, ..	178	107	285	
30	F. T. Denner	,,	204	79	283	22
26	Mrs. A. Dumas	,, ..	205	69	274	23
18	C. Ludwig	,, ..	183	90	273	24
45	C. H. Oliver	,, ..	176	96	272	25
3	W. M. Bayles	,, ..	213	78	271	26
11	R. W. Pope	,, ..	233	29	262	27
32	N. Burston	,, ..	168	86	254	28
12	G. Hayman	,, ..	196	54	250	29
39	L. McLean	,, ..	136	112	248	30
29	A. S. Hyndman	,, ..	143	93	236	31
6	J. J. West	,, ..	158	78	236	
21	A. E. Payne	,, (5 birds)	153	75	228	33
101	A. E. Silbereisen ..	,, ..	106	108	214	34
19	Benwerren Egg Farm ..	,, ..	144	61	205	37
42	Thirkell and Smith ..	,, (5 birds)	144	61	205	
5	W. G. Osburne	,, ..	182	43	205	
8	E. A. Lawson	,, ..	118	88	206	35
43	S. Busenmb	,, ..	120	86	206	
20	H. Merrick	,, ..	162	20	182	40
35	Tom Fisher	,, ..	69	108	177	41
33	E. F. Evans	,, ..	91	59	150	42
9	W. H. Clingin	,, ..	71	42	113	43
4	Fulham Park	,, ..	36	54	90	44
31	J. H. Gill	,, ..	58	24	82	45
		Total ..	8,110	3,808	11,918	
		HEAVY BREEDS.				
		DRY MASH.				
98	Marville Poultry Farm ..	Black Orpingtons ..	235	135	370	1
97	D. Fisher	,, ..	223	119	342	2
100	Oaklands Poultry Farm ..	,, ..	200	121	321	3
94	Mrs. Coad	,, ..	160	113	273	4
95	T. W. Pearce	,, ..	131	101	232	5
96	H. Hunt	,, ..	18	119	137	6
99	J. Ogden	,, ..	42	48	90	7
		Total ..	1,009	756	1,765	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.6.16.	15.6.16 to 14.7.16	Total to Date.	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	W. H. Robbins ..	White Leghorns ..	274	136	410	1
59	T. A. Pettigrove ..	,, ..	273	132	405	2
56	Mrs. Nicoll	,, ..	240	127	367	3
61	C. C. Dunn	,, ..	258	105	363	4
52	W. J. Thom	,, ..	255	99	354	5
54	Mrs. A. O. Hughes ..	,, ..	249	100	349	6
53	W. N. O'Mullane ..	,, ..	244	103	347	7
58	C. Ludwig	,, ..	242	101	343	8
70	G. Wilkinson	,, ..	225	110	335	9
65	Izard and Tierney ..	,, ..	241	93	334	10
62	J. W. Morrow	,, ..	229	91	320	11
47	H. McKenzie and Son ..	,, ..	176	115	291	12
48	Thirkell and Smith ..	,, ..	192	75	267	13
60	A. Greenhalgh	,, ..	175	90	265	14
49	C. Lane	,, ..	166	99	265	
55	Rev. J. Mayo	,, ..	181	65	246	16
69	E. A. Lawson	,, ..	152	88	240	17
64	A. Bennett	,, ..	193	40	233	18
67	Lysbeth Poultry Farm ..	,, ..	147	86	233	
51	Reliable Poultry Farm ..	,, ..	140	64	204	20
50	Clevedon Poultry Farm ..	,, ..	126	53	179	21
63	N. Burston	,, ..	56	103	159	22
66	Benwerren Egg Farm ..	,, ..	64	76	140	23
68	W. G. Osburne	,, ..	63	30	93	24
		Total ..	4,561	2,181	6,742	
		HEAVY BREEDS.				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	294	120	414	1
89	Brooklyn Poultry Farm ..	,, ..	236	110	396	2
87	S. Buscumb	,, ..	238	115	353	3
72	Marville Poultry Farm ..	,, ..	260	74	334	4
85	Mrs. M. Coad	,, ..	200	128	328	5
83	L. McLean	,, ..	197	130	327	6
92	J. H. Wright	,, ..	195	129	324	7
80	Mrs. M. Pearce	,, ..	213	102	315	8
86	C. Ludwig	,, ..	235	80	315	
88	A. D. McLean	,, ..	198	115	313	10
93	L. W. Parker	,, ..	195	108	303	11
79	Stranks Bros.	White Orpingtons ..	206	81	287	12
81	K. Courtenay	Faverolles ..	185	86	271	13
90	Excelsior Poultry Farm ..	Black Orpingtons ..	132	114	246	14
78	Reliable Poultry Farm ..	,, ..	131	114	245	15
77	Mrs. G. R. Bald ..	White Plymouth Rocks	147	70	217	16
91	N. Papayanni	Black Orpingtons ..	106	100	206	17
73	E. W. Hippe	Rhode Island Reds	104	85	189	18
84	H. L. Trevana	,, ..	79	98	177	19
71	C. E. Graham	Black Orpingtons ..	40	95	135	20
76	L. A. Errey	Silver Wyandottes	51	83	134	21
75	Mrs. Drake	Rhode Island Reds	50	58	108	22
82	J. Ogden	Black Orpingtons ..	4	67	71	23
		Total ..	3,746	2,262	6,008	

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

GROWING FEED FOR COWS: LESSONS OF THE DROUGHT.

By Jas. Grant, Dairy Supervisor.

The drought of 1914-15 was disastrous to the dairy farmers of this State generally, for two reasons, one was overstocking, and the other was neglect to make enough provision for a bad winter; dairy farmers were thrown on their own resources, as grass was not to be had at any price.

A few did make provision, amongst them was Mr. Chas. Bland, of Yarram, who, at the beginning of 1915, made up his mind that he was in for a bad autumn and winter. Mr. Bland has a farm of 160 acres, close to Yarram; the land is level, and consists of good, friable loam over a clay subsoil; and is good farming land, except a portion liable to floods along the Tara River.

Of this he cultivated 20½ acres in 1915. Of the 20 acres, he had a paddock of 8½ acres of stubble ploughed up and worked at the beginning of March. This was drilled with 2½ bushels of Algerian oats, and 50 lbs. each of bone and superphosphate; this came up well towards the end of March; another 5 acres of oat stubble was treated in the same way later, and came up in April; also 7 acres was sown with 80 lbs. of wheat, and 80 lbs. of bone and superphosphate—this came up on the 1st June.

On the 14th June, the 8½ acres were ready to be fed off, being then 6 to 8 inches high, fairly thick, and growing well. Into this fifteen milking cows, some of them strippers, were turned. During July, twenty milkers were grazed on the two oat paddocks; and in August, twenty-five milkers were grazed on the 20½ acres, having the run of the three paddocks alternately. There were also on the farm 10 springers, 10 yearling calves, and 4 horses; these, with the cows, had the run of the green feed during August and up to 15th September, when they were all taken off. The yearlings were sold at good prices, and the springers came in in good condition.

The returns for the three months from 14th June are as follows:—

Milk sold last fortnight in June	£14	0	0
Milk and cream sold in July	40	0	0
Milk and cream sold in August	40	0	0
Milk and cream sold to 15th September ...	23	0	0
Profit on yearlings	10	0	0
Grazing springers (5 weeks at 2s. 6d.) ...	6	0	0

Mr. Bland has also from the 20½ acres, 30 tons of good hay, 240 bushels wheat, and a stack of wheaten straw.

These cattle and horses had the run of the rest of the farm, on which there was little grass and less nutriment, till about 1st September. A large number of cows and other cattle died in Yarram district that winter from impaction through want of green feed.

Mr. Bland is satisfied that it pays to grow winter green stuff for the dry cows, as they then come in in good heart, and milk well.

Now, if Mr. Bland had not put in this early green feed, he would have had to see some of his cows die, to sell his yearlings at a low

price, and have his springers come in very poor and weak; nor would he have had the receipts for cream and milk during the three months shown above.

The hay, wheat, and straw he would have had if he had sown later; they are put in to show that, by early sowing, you can get two crops first milk, and later hay or wheat.

The lessons to be learned from the drought are, for South Gippsland, at any rate: to plough stubble early, or have fallow ready in January; work to a fine tilth; drill in in February 2½ bushels Algerian oats, with 100 lbs. suitable manure per acre. If you can do so, cross drill half the seed each way, so that the ground may be covered as soon as possible.

If your ground is in fine tilth, you need not be afraid to sow before rain, no matter how dry the ground is; it is very seldom a crop fails in the autumn if properly put in.

Have a reserve of grass and clover hay cut during good years, or oaten, pea or other straw. (I am not giving advice to the man who fills a silo every year; he does not need it.) Have a stack-yard and make suitable stacks of fodder. Do not be tempted to sell or waste this straw or hay, as droughts will home again as bad, or worse, than 1914-5.

Overstocking.—Do not overstock; do not overstock, especially with dairy cows; this should be stamped on the lining of every dairyman's hat. If you must overstock, stock up with cattle that can be turned off quickly as fats, and so make room for your cows.

You never see a fattener overstock; he always has grass to spare. He can see his mistake, if he overstocks, quicker than a dairyman; it is written quite plainly on the backs of his bullocks, and he can see it every time he goes down the paddock. Again, do not overstock; be able to say, "I am right for the next six months; there is enough green stuff sown, ensilage, hay, and straw in the yard to see me through."

Milk less and better cows; weigh and test milk, and cull heavily; make twenty cows do what thirty are doing; less work, less feed, for the same money. It can be done.

Grow at least half an acre for each cow milked. Let the green feed get a good start before putting stock in—another week's growth in the early stages will give you a lot more feed later on.

It pays to grow feed and milk in a bad year—many dairymen got 2s. 3d. for butter fat last winter.

Do not give a weak cow dry chaff. A strong cow will do better on chaff that has had boiling water put on it, and covered for twelve hours. Dry chaff is very injurious to a weak cow.

Keep your herd young—the old cows were the first to go—very few cows are worth keeping over nine years old.

Have drinking water in troughs at convenient and accessible spots—one at the yard, if possible. Weak cows are afraid to go down steep or into boggy places for a drink, and so become very thirsty. When they at last go in they drink too much, and get chilled, and are unable to get out again.

Many dairymen lost enough cows through this cause to put up three wind-mills, let alone one.

Do not milk your cows too long in the face of a bad season and no green feed. It is hard to notice the falling off in condition from day to day. Keep a close watch, and when cows start to lose condition rapidly, dry them off at once. Provide good winter paddocks for your

dry cows, for it pays to have your cows come in half fat. Even if it cost you 10s. per head more for grass, the cow will be worth 10s. more to look at, let alone the extra money she will give you, because she is in good condition in the spring.

This is not written to puff up any particular farm or district; what Mr. Bland has done, any ordinary dairy farmer can do. The only unusual feature was the mild winter of 1915. There is no expensive machinery to be got, no cutting, carting, and hand feeding of green stuff. Do as he and others have done. Look ahead; start putting in crop early, subdivide farm, and have some definite plan to work to

VICTORIAN RAINFALL.

Second Quarter, Year 1916.

During April the rainfall in the north and north-western areas was very small, and was much below requirements, but the remainder of the State fared much better, more especially in the north-east and central districts. The early rains were the results of tropical disturbances and benefited the eastern districts only; but the remainder of the disturbances being Antarctic in character were of especial benefit to the southern areas mainly. An extremely dry month was experienced in May, and only about half of the usual quantity of rain was received, the greatest deficiency occurring in the western and Wimmera districts. This was an extremely cold month, and frosts were very prevalent towards the end, there being six consecutive days of frost which penetrated to most inland districts except Gippsland. Frost visitations of so early a character, and so severe a nature, have been unknown in Victoria in the past, and these constitute a record for severity and frequency in May. The month of June was extremely favorable, both with regard to the amount of rain and the period over which the falls extended, almost general rains being experienced on nineteen days; except in Gippsland and parts of the central south, the amounts were much above the normal, northern Mallee and the northern Wimmera showing the greatest excesses. Owing to a large amount of dry grass and a slight mixture of green, Mallee stock in April, though falling away, were still in fair to good condition. The chief concern was for the welfare of the lambs as the dry feed would not be conducive to progress. The same applies to parts of the west; elsewhere stock were in splendid condition.

In north-western areas the water supply was deficient. Water was also scarce in these parts during May, and water cartage had commenced. Stock were fair to good, and in the west much sown grain had germinated, but had died off. Potato yields were generally satisfactory except in the north-central. At the end of June, owing to the abundance of rains, grass was plentiful, the crops were showing up well above the ground, but in the Wimmera the sowing had to be deferred and most of the crops in this district will be late. Complaints with regard to want of water for stock and domestic purposes have now

anished. In the west some bitterly cold weather and severe frosts were experienced, and in the neighborhood of the plains grass and crops were backward and paddocks bare. Sheep were doing well throughout, and lambing percentages promised to be high.

District.	—	April.	May.	June	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	25	77	211	313
	Normal	78	114	124	316
	Per cent. departure from normal	−68	−32	+70	−1
Mallee South	District Mean.. ..	40	74	253	367
	Normal	101	132	166	399
	Per cent. departure from normal	−60	−44	+52	−8
North Wimmera ..	District Mean.. ..	56	75	336	467
	Normal	130	163	208	501
	Per cent. departure from normal	−57	−54	+62	−7
South Wimmera ..	District Mean.. ..	93	84	370	547
	Normal	154	192	264	610
	Per cent. departure from normal	−40	−56	+40	−10
Lower Northern Country	District Mean.. ..	61	101	316	478
	Normal	119	166	207	492
	Per cent. departure from normal	−49	−39	+53	−3
Upper Northern Country	District Mean.. ..	108	111	331	550
	Normal	150	195	257	602
	Per cent. departure from normal	−28	−43	+29	−9
Lower North-East ..	District Mean.. ..	191	132	522	845
	Normal	177	251	366	794
	Per cent. departure from normal	+8	−47	+43	+6
Upper North-East ..	District Mean.. ..	378	238	573	1,189
	Normal	264	370	585	1,219
	Per cent. departure from normal	+43	−36	−2	−2
East Gippsland ..	District Mean.. ..	131	102	202	435
	Normal	239	254	316	809
	Per cent. departure from normal	−45	−60	−35	−46
West Gippsland ..	District Mean.. ..	281	191	327	799
	Normal	283	300	350	933
	Per cent. departure from normal	−1	−36	−7	−14

VICTORIAN RAINFALL—*continued.*

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	304	189	298	791
	Normal	272	305	338	915
	Per cent. departure from normal	+12	−38	−12	−14
West Central	District Mean.. ..	173	99	255	527
	Normal	195	217	242	654
	Per cent. departure from normal	−11	−54	+5	−19
North Central ..	District Mean.. ..	181	136	371	688
	Normal	189	250	327	766
	Per cent. departure from normal	−4	−46	+13	−10
Volcanic Plains ..	District Mean ..	153	69	312	534
	Normal	190	226	266	682
	Per cent. departure from normal	−19	−69	+17	−22
West Coast	District Mean.. ..	235	140	401	776
	Normal	241	203	354	898
	Per cent. departure from normal	−2	−54	+13	−14

N.B.—100 points = 1 inch.

11th July, 1916.

H. A. HUNT,
Commonwealth Meteorologist.

ORCHARD AND GARDEN NOTES.

(E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.)

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there will be danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales. It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Pyrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying

should be completed as early as possible. This mixture has a certain value as a fungicide, and it is well worth trying on peach trees that have been affected with the leaf curl; more especially in view of the fact that in some districts severe burning has occurred in peach orchards as a result of using Bordeaux mixture late in the season.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, adding a teaspoonful of caustic soda to a cask of steeping stems. The liquid should be made strong, and every endeavour should be made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month. The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees should be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree should be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. The soil should be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects should be regularly collected and destroyed.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables grown quickly are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they shou'd have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots, placing three or four seeds in each pot. They then suffer no check when being transplanted into beds.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings that are growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox; may be still planted out. If it is intended that such plants shall remain in the same location as last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergreen shrubs may now be planted out, the soil having previously been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Still continue to feed stabled horses well; feed green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Continue giving hay or straw to grass-fed working horses. *Feed old and badly-conditioned horses liberally. In foal mares due to foal early,* if worked, should be turned out to paddock. Feed stallions doing stud duty liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ½ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be

turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Considering the present high price of pork, there should be a good margin of profit in fattening pigs. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

SHEEP.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep or lambs not good enough for freezing also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting. Only dense seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing.

POULTRY. September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insecticbane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

FARM.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with *the fallowing in the Northern Districts. Prepare land for tobacco seed beds* by burning rubbish on the site; afterwards work up to depth of three or four inches.

ORCHARD.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with Bordeaux mixture as the blossom buds are opening, as a preventive against "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

FLOWER GARDEN.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

VINEYARD.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab with acid iron sulphate vines which showed signs of Black Spot last season. To avoid burning, this must be completed before the buds commence to swell. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.